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GAS JOURNAL

LIGHT • HEAT • POWER • BYE-PRODUCTS

[Founded in 1849 as the "Journal of Gas Lighting."]

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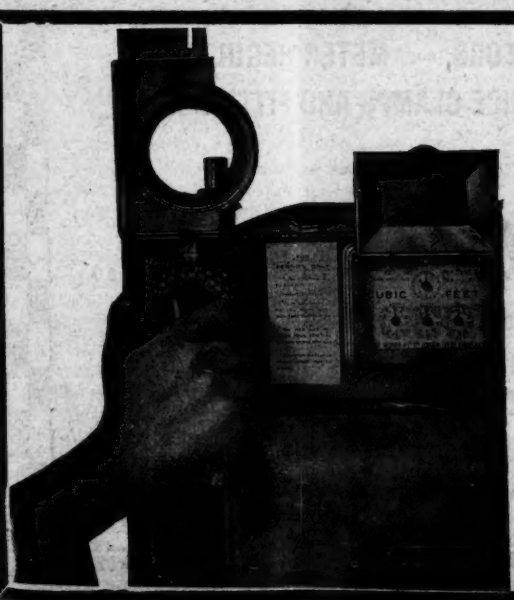

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VOL. CLVII., No. 3064.] WEDNESDAY, FEBRUARY 1, 1922. [74TH YEAR.

EDITORIAL NOTES.

The Institution and Carbon Monoxide.

THE President of the Institution of Gas Engineers (Mr. Thomas Hardie), in a letter published in our "Correspon- "dence" columns to-day, deals with the suggestion of Dr. Haldane that gas engineers should make an investigation to ascertain what (if any) additional precautions could be taken in respect of carbon monoxide in gas, as well as with the proposal of Dr. Carpenter that the Institution of Gas Engineers is the proper body to make such an investigation. While the President considers that the terms of Dr. Carpenter's suggested inquiry are too wide, he makes an alternative proposal for the consideration of his Council. In his view, it is necessary to be prepared for further attack; and therefore it is essential that: (1) The fullest information of the facts of every case of gas poisoning should be obtained; and (2) mains, services, fittings, and appliances should be constructed, maintained, and operated so as to make accident from leakage practically impossible. In his opinion, investigations on these two matters can be carried out by the Institution with great benefit to the industry. The proposal will now be brought before the Council; and it will be for them to decide. Whatever their decision, it will, we feel sure, have the loyal support of the gas profession generally.

The Carbon Monoxide Folly of the Newspapers.

THERE has been an influenza epidemic, there are numerous unemployed people in every city and town, conditions generally for many people are very difficult, some people have lost money, many are perplexed by the problem of how to make both ends meet, and changeable atmospheric conditions are anything but enlivening to the spirits. There is a large amount of depression abroad; and there is a small crop of gas fatalities. There have been what the newspapers call "gas tragedies" in Cardiff, Liverpool, Manchester, and London. There have been people who have taken the course of getting clear of their troubles by placing their heads in gas-ovens, with the gas-tap turned-on. There are unmarried couples who have been found dead—in one case in a bedroom with a gas-fire tap turned-on, and in another case at Cardiff in a bath-room. At Liverpool, out of a family of five, three are dead, while the mother and a son were alive after being six days in a house filled with gas. That is curious. There were three deaths (a father, mother, and child) at Manchester; and this through the tenant doing what he ought not to have done—he fitted a defective heater in a defective manner to an incandescent gas-burner. These so-called "heaters" are not recommended by gas suppliers. They are crude and unventilated; and when fitted, as this one was, by the householder himself, there is the danger of incomplete combustion. But there have been in a short time about a dozen people asphyxiated out of the millions of people who are living in gas-lighted houses, in which food is cooked by gas, countless rooms are heated, and hot water is supplied by the same agent.

Why is it that just at this particular time there is this so-named "epidemic" of gas poisonings or asphyxiations? Part of the suicides, we are strongly of opinion, can be put down to the folly of public newspapers giving the prominence they have done to carbon monoxide correspondence and to suicides by the gas method. There is great power in suggestion; and two scientific men and "The Times" have provided ample suggestion for people whose minds are affected or are unhinged through their personal worries. Such people do not want suggestion of this kind, which may be unfortunately turned by them into melancholy action. Of course, before water gas was utilized, there were people who, desiring to end their lives, placed their heads in ovens, or put gas-tubing to their mouths, or sealed-up windows and doors and turned on gas-taps—with fatal results. There were also people who had been seeking pleasure unwisely, whose mental balance was therefore temporarily not all that is desirable, and who managed somehow to turn on gas-taps leading to unlighted burners. All these things cannot be charged to gas, any more than a river or a railway can be charged with suicidal happenings, or motor cars be charged with the deaths of drunken or careless persons. Why are there so many gas-taps found open just now, and gas allowed free vent into rooms? It is due to something more than the carbon monoxide content of gas. There are some newspaper writers who are "know-alls" in these matters, or fancy that they are. We see that one leader writer in a provincial newspaper says: "The type of "gas as generally supplied at the present time is a much "more poisonous gas than it used to be." That writer has doubtless been reading the views of Prof. Bone and Dr. Haldane in "The Times." In this connection there is one thing we should like to have explained by these people who know so much. At the present time in most gas supplies the percentage of carbon monoxide is well below the 20 p.ct. that the two scientists advocated. But it was not below the 20 p.ct. in several gas-supply areas during considerable periods of the war, and during the coal strike. This being so, why was there not an epidemic of fatalities when the proportion of carbon monoxide was so much higher, while there is the present crop at this time when the percentage of carbon monoxide is much lower? We can find no other answer than that part of it is due to the suggestion provided by the newspapers in giving prominent publicity to such matters. Of course, some of the fatalities are due to carelessness, and so are most fatal accidents in other directions, and by other means.

It is noticed that Mr. D. Brownlie has added a letter to the carbon monoxide correspondence in "The Times;" and it is manifest that he is writing about something of which he knows little. He asserts that before the war the gas companies were "allowed" to add to straight coal gas about 15 p.ct. of water gas. As a matter of fact, there was no question as to any "allowance." Gas suppliers had precisely the same free hand then as now; and generally the way they exercised their liberty was to add from 25 to 30 p.ct. of water gas to the coal gas. There were a few who went up to about 40 p.ct. Thus the gas companies have not abused the liberty. They exceeded the normal percentages considerably when fuel was an exigent necessity in the country, and without any noticeable trouble. But now gas undertakings are again back to about the pre-war normal. Mr. Brownlie mentions the Manchester fatalities. His facts are not right. They are as stated by us earlier in this article. He thinks that what exists now is a scandalous thing, although the gas distributed during the war

and the coal strikes contained a much larger percentage of carbon monoxide. We are wondering why Mr. Brownlie should pose as an authority in this matter, when his letter shows he knows so little about it. He had far better stick to his own subject—steam-boilers.

Gas and Electricity Combinations.

FROM the birth of the electricity supply industry, the Legislature and the electrical engineering profession have regarded it as something separate and perfectly insulated from all else in respect of its operations. This is a congenital error that has become a tradition with most electrical engineers. But an attack is being made upon it. A new school of engineering thought has sprung up, and is growing into something quite robust. The past decade has heard freely debated the questions of fuel conservation, thermal efficiency, and the rescue of the valuable constituents of coal from destruction during its utilization as a heat producer. This is resulting in the initial spread of the view that the provision from coal of light, heat, and power in this country should be treated as an indivisible matter, and coal utilization should be co-ordinated and systematized so that the maximum advantage should be realized. It is a big subject affecting national economics, and so it ought to be seriously treated. It has, however, to be confessed that hitherto throughout the piece in the development of the light, heat, and power industries, there has been an absence of vision: and so here we are to-day working in the main along distinct lines and promoting developments which are continuing an uneconomy that the so-called "reconstruc-"tion" plans of the Government should have sought to remove. It has remained for individuals to point this out, and to initiate practical developments on new lines.

The gas industry can claim to have taken the lead in this matter. Sir Arthur Duckham has time and again advocated that a clean cut should be made in the matter, and that an inquiry should be held, with coal conservation in view, into the general question of the provision of light, heat, and power. Mr. A. Hugh Seabrook, prominent in electrical engineering, in the paper that he read to the London and Southern District Junior Association last Friday, urged the formation of a Gas Commission, and the merging of the Electricity Commissioners and the Gas Commissioners into a Light, Heat, and Power Commission. Lieut.-Col. H. W. Woodall (now partner with Mr. Seabrook as consulting engineers in the development of light, heat, and power services), in his Presidential Address to the Southern District Association of Gas Engineers and Managers, a few years ago, was promulgating similar views, and favouring in the national interests the linking-up of gas and electricity supplies. Before and since then practical work, originated in the gas industry, was being, and has been, done in getting in the thin end of the wedge to bring about within certain areas the combination of gas and electricity supplies. Sir Corbet Woodall was in his latter years becoming quite a protagonist in this direction, having before him the economies that his discerning ability had enabled him to foresee. The Tottenham Light, Heat, and Power Company, with its electrical business at Wood Green, is one result of his initiative in this respect, working in conjunction with the Chief Engineer of the Company (Mr. A. E. Broadberry, M.Inst.C.E.). There are several other examples of combination of the two services in connection with what was originally only gas enterprise. This all quite conforms with the spirit of the report on "Gas Standards" of the Fuel Research Board and of the legislation embodied in the Gas Regulation Act—particularly the developing powers adumbrated by section 10. Then there was the proposal of the South Suburban Gas Company, in a Bill a few years since (in which project Mr. Charles Hunt, the Chairman, foresaw great potentialities), for the generation on their Belvedere site of electricity for the purposes of the new gas-works and the supply of current in bulk to neighbouring industry and to authorized distributors. Some electrical people apparently did not want to assist forward the utilization of available fuel in this way, and to realize the advantages of economical production; so that idea was promptly nipped in the bud. Since then we have the Beckton scheme for the development of a large power station on the Gas Light and Coke Company's land, with all the facilities the Company have there for providing fuel and handling material. This again appears to have been shelved by the powers that be—at any rate, for a time.

This is all pioneering work and scheming; but it requires to be carried farther with energy and with the intention of gaining the objective—gradually perhaps, but surely. It is upon this work that Mr. Seabrook is now particularly concentrating. He is endeavouring to cultivate a new outlook among gas and electrical men, and to bring about what is a rational combination in effecting the most economical use of fuel for two purposes on one site. This is true engineering. In certain branches of engineering, there must be specialization; but the engineer whose business it is to make provision for the utilization of the primary fuel with which Nature supplies him, only truly fulfils his professional duty and mission by putting the raw material to use in a manner that will bring to the service of mankind the maximum of that which is incorporated and stored in it. Mr. Seabrook says he is afraid he must confess to a leaning towards the unorthodox as an electrical engineer. Maybe as an "elec-"trical engineer;" but, as an "engineer," the work he has taken in hand to endeavour to effect a closer alliance between gas and electricity in providing light, heat, and power is not only a leaning towards, but a pursuit of, the true principles of engineering.

In this direction, Mr. Seabrook believes there are great possibilities for both these essential public services; and especially, as a start, in the small gas-supply areas. Gas-works are established in places running down to quite modest populations. Electricity may not be available in many of these; but still the desire to have it may exist. Where there is the desire, it means either the laying-down of a small independent system, or the gas-works owners utilizing site, buildings, fuel, and organization as a running concern in extending their business to embrace electricity generation and supply. The latter course must be the more economical. Again, there are many towns in which there are gas and electricity supplies, and in which perhaps reconstruction of the plants is now badly needed. The past seven years have shown how difficult it is for these small concerns to continue an independent existence in competition, make a profit on the capital, and yet supply the consumers at a reasonable commercial price. The times have changed for the worse for both. Costs do not appear, by any test that can be applied, as though they will ever again reach pre-war levels. Coal cannot possibly do so; nor therefore can the plant and other appliances needed by both concerns. This being so, and coal being essential to the gas-works and fuel to electricity generation, concentration is a natural thing; and the place for concentration is at the gas-works, where the coal must be first treated, and where coke or coke breeze can be utilized for raising steam, or gas produced from coke be utilized in gas-engines, for the generation of electricity. There are many instances to-day of large electricity power stations using under their steam-boilers coke or coke breeze, with substantial working advantage and economy. This coke or breeze has, however, to be conveyed from the nearest gas-works. If the power stations and the gas-works were on the same site, the economical advantage of proximity in saving labour and carriage costs, and (who can tell?) perhaps promoting the conservation of heat by the transfer of the incandescent spent charges direct from the retorts to the furnaces of steam-boilers or to gas-generators, would be brought in as a further credit. Mr. Seabrook, with trained mind, pictures many possibilities. In larger cases, there is example in the Beckton scheme, and also in that of the South Suburban Company. There is no reason whatever why the suggested plan of the latter should not be developed, and gas undertakings, with their large facilities, enter upon the generation and supply of electrical energy in bulk to authorized distributors.

Looking over this field of work, Mr. Seabrook, Lieut.-Col. H. W. Woodall, and their associates see much that could be done and would be beneficial to the community by effecting progress in the provision from one station of the two services, and by promoting economy in the carriage and expenditure of fuel, while taking from the original raw coal all that is of value in it. The paper to the London and Southern Junior Gas Association only lifts the veil from this work, and reveals the thoughts of one whose belief in the efficacy of the junction of the two services is such that he is endeavouring to develop it, as being the correct policy, in his professional practice. It will (we have no doubt he already recognizes) mean much labour; and there will be considerable obstinacy on the part of custom and current method before there is general consent to yield to a common-sense union.

The Thermal Value of the Blow Gas.

IN later columns of this issue, there is a thermal study by Mr. Harald Nielsen (who has contributed interest to our columns on previous occasions, especially in the matter of the new rotary retort system) of the claims made for complete gasification, and respecting heat losses in the water-gas process —particularly the blow-gas loss. He seeks to bring this loss into profitable account; and, in doing this, he carries us along the thermal way step by step by the aid of calculation, which must have required of him considerable industry. From it all, let us attempt to indicate the lines and results of the study.

In criticizing any complete gasification system, a rough-and-ready sort of thermal balance-sheet can always be worked-out, which will indicate within reason what may be expected from the plant on the basis of ordinary modern producer-gas practice, regarding which some excellent papers have been read recently. Furthermore, there is the old-established water-gas practice from which the endothermic reactions, or rather heat losses, are well known; and it will here be of assistance to remember that theoretical water gas consists of 50 p.ct. H_2 and 50 p.ct. CO, and that the reaction in short is: $C + H_2O = CO + H_2$, *minus* about 74 B.Th.U. per cubic foot. This latter figure will vary slightly according to the excess of hydrogen per cent. over the carbon monoxide per cent. When the water gas contains carbon dioxide (which it generally does), then for every per cent. of carbon dioxide per cubic foot, 5 B.Th.U. have to be deducted from the 74 B.Th.U.—the difference representing the amount of heat which is required to produce the water gas, and has to be provided by the blow.

As the water gas generally leaves the producer at a temperature of about 750° Fahr., the blow gas has also to provide the B.Th.U. represented by the sensible heat, together with any losses due to radiation and convection. It stands to reason that the most efficient way to do this is to utilize to the fullest extent the greatest heat-giving reaction: $C + O_2 = CO_2$. That is to say, the blow gas should only consist of carbon dioxide and nitrogen, or really be like the flue gas of a modern, highly efficient boiler plant. This is, however, not a practical proposition in water-gas practice, because ideal complete combustion conditions do not exist. Instead, it will be found that, in ordinary running, the blow gas will have the following average composition, according to the Birmingham tests by Prof. Cobb and Dr. Parker: CO_2 11·9 p.ct., O_2 0·2 p.ct., CO 12·8 p.ct., H_2 3 p.ct., CH_4 0·4 p.ct., N_2 71·7 p.ct. The net thermal value per cubic foot of this blow gas is 52 B.Th.U. at normal temperature and pressure; and it is here Mr. Nielsen thinks there is room for improvement. He maintains that, if this very low-grade gas cannot be utilized directly at the spot where it leaves the producer—in a waste-heat boiler, for instance—it simply represents a dead loss, once the gas is cooled down, as it is too poor to be ignited other than in a highly superheated condition. That this loss is of considerable magnitude will be clear, when it is remembered that for every cubic foot of water gas, from 2 to 3 c.ft. of blow gas are produced; and with a production of (say) 50,000 c.ft. of water gas per ton of ordinary coke, the latent heat lost in the blow gas represents over 20 p.ct. of the total heating value of the coke, besides the loss in sensible heat of the highly heated blow gas leaving the stack. Therefore, all in all, the particular blow gas mentioned above represents a dead loss of about 30 p.ct.

Mr. Nielsen's idea is to try to retrieve this loss by sacrificing a little on the water-gas side—that is to say, to reduce the make to (say) 38,000 or 40,000 c.ft., and then to obtain a blow gas equal to blast-furnace gas in heating value. This gas could then be conducted away from the producer; and, when firebrick-lined mains are employed, a fairly considerable drop in temperature could be allowed. The gas would still be an efficient fuel for gas-fired boilers, or, when cleaned, for gas-engines. Depending upon which of the methods is employed, the KW.-hours produced by the surplus blow gas, otherwise wasted, would amount to 170 to 320 KW.-hours per ton of raw coal treated. The plan that Mr. Neilsen has in mind is to superheat the hot water gas leaving the producers up to a high, fairly constant temperature, and utilize its sensible heat for distilling-off a certain amount of the volatile matters, which can be recovered in the form of low-temperature tar oils—the uniformly carbonized semi-coke being conveyed in as hot condition as possible to the water-gas generators.

The thermal balance-sheet is based on the production of a blow gas of a comparatively high heating value of about 85 B.Th.U. net per cubic foot; and the heat set free by the "blow" gas reaction covers the deficiency in the water gas reaction. The balance-sheet also indicates that, in order to produce a gas of about 400 B.Th.U. gross value, and recovering the tar oils worth recovering, the high calorific gas make cannot exceed 35,000 c.ft., or (say) 40,000 c.ft. when specially selected coals are employed. The B.Th.U. value of the gas can be increased 30 to 40 B.Th.U. per cubic foot if the lighter tar oils are used for carburetting the gas.

According to Mr. Nielsen, by the method of combined low-temperature distillation by water gas, and utilizing the "blow" gas for direct power production on the spot, the over-all thermal efficiency would be very high—at least 20 p.ct. higher than water-gas production or complete gasification without heat recovery on the old lines. From a municipal point of view, the arrangement would be ideal.

The Weak "Spot" of the Gas Industry.

WE ask for sympathetic consideration from readers for the cogent letter which Mr. R. G. Shadbolt, the Chairman of the General Council of the National Association of Technical Gas Officials, addressed to us last week, and which was published on p. 213. The letter was headed "The "Weak Spot of the Gas Industry;" but "spot" falls very far short in descriptive accuracy of the magnitude of the evil or defect to which Mr. Shadbolt calls attention. Not long ago the industry was justly groaning and agitating over its "financial hardships." These more directly concerned gas stock and share holders; but there is another financial hardship which affects all too many of the technical officials and assistants in the industry, and which only requires the will of administrators, and not legislation, to adjust. However, owing to this, where the hardship exists, nothing is done. Because there is no powerful trade union to enforce consideration of the hardship and to produce the remedy, also because of the more or less isolated conditions of the officials concerned, many administrators take advantage of the circumstances, and do nothing to effect justice—and not only justice, but to effect something that is of vital importance to the future of the industry.

What Mr. Shadbolt is aiming for is greater support and recognition of the National Association of Technical Gas Officials by those who have no personal grievance respecting remuneration and conditions of service. He presents a strong case for this being done. No one can read the facts that he submits without realizing that underpayment of many officials is a serious weakness of the industry. This underpayment is not in one sense a matter of personal concern to those who are well paid, but it is in another sense. We cannot escape the fact that this underpayment affects the whole of the industry, and the whole of its professional ranks. The stronger the weak places in our technical ranks can be made, the better throughout; and this no one can gainsay. Never was there a time when technical ability was needed by the gas industry more than now; and the need is growing day by day. It is recognized by, as Mr. Shadbolt points out, the Council of the Institution of Gas Engineers, who are busying themselves with the problem of fitly educating those who are to be our future gas engineers and managers. But if the Council of the Institution are going to stop at a programme for dealing with educational problems, they are terribly bad legislators. That would be doing only half of the work. If a training specification transcending anything that has ever before been drawn-up is the sole outcome of their work, what will it profit the industry if a large section of it refuses to pay salaries that will attract the best types of technically educated young men, and keep them within the industry? To confine the work to the drawing-up of an educational and training specification is to leave undone a part that is equally essential. The two things—the training specification and the question of remuneration—must be taken together. Otherwise, there will be constructive work without the foundation—constructive work built on sand. It is easy to see what will be the result. Are the Council of the Institution blind to this? Are the gas engineers and managers whose lots are cast in pleasant places so far as remuneration and conditions of service are concerned, oblivious to or heedless of this? Is the honour, dignity, and status of the profession as a whole nothing to them? Are those large gaps of weakness in their particular professional sphere not something to the

bettering of which they should lend their position, influence, and support? We think they are. The help of those who are in good case is badly needed.

There is another point. Observation of the trend of things caused us to call attention to it on a previous occasion. We have seen quite a number of technically trained, brainy young men snapped up by the manufacturers of gas plant and appliances. They are wise. They appreciate the value of such men. Through them they are strengthening their side of the industry. It is all to the common good. But what does it mean? That the manufacturers of gas plant and appliances recognize more than many gas-supply administrators the value of these technically trained men, and make it worth their while to go over to them. The remuneration they offer, knowing that it is a good investment, is more attractive than that offered by the majority of gas undertakings. Ability will seek its reward wherever it can be obtained. There is not the slightest reason why there should not be sufficient well-trained and competent men to go all round—among gas undertakings and manufacturers alike. The supply of such men will respond to proper remuneration and conditions of service.

It was this long-continued weakness, and the view that the future of the gas industry and of the gas-engineering profession demanded the eradication of the weakness, that brought into existence the National Association of Technical Gas Officials. The narrow, circumscribed view of some men is that the Association is only a salary-raising piece of machinery. Its functions and purpose extend beyond that. Through remuneration and conditions, it is working for something of the greatest importance to the industry. It is operating for the establishment of more ability in the industry by ensuring for it due reward. That is a purpose which should have the whole-hearted support of the profession. As Mr. Shadbolt points out, the very first "object" of the organization, as stated in the rules, is: "To raise and "maintain the efficiency and general status of the technical "officials engaged in the gas industry." The third is: "To "ensure that only qualified persons are appointed to respon- "sible positions involving the engineering, management, "direction, and control of a gas undertaking, or to other "positions in the technical departments of the gas industry." That is what is wanted. To ensure the realization of these things, a condition precedent is adequate remuneration. Nothing else will do or suffice.

The letter we published last week from Mr. Shadbolt is one of the strongest cases yet put forward for the National Association of Technical Gas Officials. He wants the organization to be made an effective machine—not only on individual, but on industrial grounds. There is no other gas organization that will touch this matter—crying, patent, and potent evil though it be. So long as this is so, so long as the weakness is not dealt with by other bodies, then there is a duty and responsibility resting upon the profession generally to help to make soundly effective the only Association attempting to establish and to apply the remedy. Who will respond to Mr. Shadbolt's appeal?

Reductions in Prices of Gas Appliances.

THE reductions in the prices of gas appliances that have been announced in the last two issues of the "JOURNAL" is what gas undertakings have been expecting would occur. They have seen prices of materials and labour falling all round; and therefore it was only natural that accretions of the prices of gas appliances during the time of ascending costs should show a decline as soon as possible when the movement of costs was the other way about. As a matter of fact, the manufacturers of gas cookers, fires, and other gas-consuming appliances had made no secret of the fact that their policy was price declension as soon as circumstances favoured. They are keeping to the understanding. They know full well that the maintenance of high prices is not to their advantage, any more than it is to that of the gas undertakings. Anything that restricts the business of the latter will restrict their own business. Gas undertakings have not been in the position to spend so freely as they would otherwise have been doing owing to the dearness of money, and its relatively low purchasing power. But those conditions applied just as much to the manufacturers as to the gas undertakings. At the same time, there was the feeling, which was translated into policy, that while prices were at the peak of cost to which they ascended, it was impossible to make a push for new gas consumption with the vigour that would obtain with the costs of appliances at a lower level. The price of gas is something that cannot be stretched beyond the economic level at any time; and all contributory expense that tends to keep it up is a restricting disadvantage to both gas undertakings and the manufacturers of gas appliances. To our mind, it is a great pity there is not a more tangible recognition of the oneness of interest that in reality exists between the operations of gas undertakings and the producers of their requirements. However, the prices of gas appliances have fallen. This will be an inducement to more activity in promoting gas consumption, though hoped-for bottom prices have not yet been reached. But all will come right in good time, though any expectation of the reappearance of what was normal in pre-war time must be generally cancelled; for we have to realize that conditions have more or less permanently changed, and what will be the approximate new normal levels are in process of being created.

"The Gas Salesman" Supplement.

We are very gratified with the number and the terms of the congratulatory letters that have been received regarding the first issue of "The Gas Salesman" Supplement. The communications are all kind, and some far too generous. But very heartily we thank every writer. It will be our endeavour to make each issue of the Supplement increasingly interesting and valuable; and all that is asked is that in this we shall have good support from sales departments in the form of articles and items of useful information. Several gas undertakings have sent orders for copies apart from the "JOURNAL" for distribution among their sales staffs. If there are any others, we shall be pleased to hear from them promptly in order to give an idea as to the approximate number of extra copies that will have to be printed.

By Special Order.

Several gas undertakings have found the value of section 10 of the Gas Regulation Act. It is a quicker and more direct way of securing additional powers than the meandering and time-absorbing course that has to be followed by a Bill in Parliament. The Gas Light and Coke Company are setting a good example by proceeding by Special Order to obtain powers to acquire the undertaking of the Ilford Gas Company. The draft of the Order will be submitted to the proprietors on Friday week.

CO Poisoning in Industry.

The question of the treatment of those suffering from the effects of carbon monoxide poisoning has been lately referred to in the "Iron and Coal Trades Review." A correspondent to that paper, Mr. Rex C. Smart, deals with two points: Use of stimulants, and treatment after restoration to consciousness. His experience in dealing with these cases has been that in no circumstances whatever should alcoholic stimulants be given, owing to the ultimate effect of a reduction in the body temperature, especially seeing that the heat-regulating centres of the body have already been affected by the carbon monoxide. A vital feature in the treatment is the immense importance of rest to the patient; and it is a feature which cannot be over-emphasized, for cases which would otherwise be serious or fatal often become mild ones. All cases of poisoning where unconsciousness has supervened may be regarded as potentially serious. In mild cases of poisoning, two hours' rest at least should be insisted upon before the patient's removal.

Mistakes of Superficial Knowledge.

It is interesting to note how, in the material that appears in the public Press, so many writers hang on to an idea, circulation to which has been given by other people, as though it was all good and sound, and acceptance justifiable. We get this in a letter by Mr. J. R. Clynes, in "The Times," on "Smokeless Cities" and the "Cost of Wasted Coal." There is nothing new in what he says. We all know the waste and uneconomy there is in the crude use of coal for heating, through the smoke emissions of chimneys—industrial and domestic—and the destruction of valuable constituents of the coal. But Mr. Clynes accepts, with a fine simplicity, the statements so freely published as to the wonderfully beneficial things that would accrue from the low-

temperature carbonization of coal. There would be air-clear towns from the use of the smokeless solid fuel; and the carbonization of 140 million tons of coal at low temperature would make us independent of the rest of the world for fuel oils and motor spirit. Probably it would; but where Mr. Clynes fails us is in not stating how this fuel oil and motor spirit would compare in price with the imported variety. Everything depends on cost. And there has been nothing shown yet that the cost of these oils, produced by existing low-temperature systems, would be on a competing scale. We do not say that no system of low-temperature carbonization will be developed that will do what Mr. Clynes is looking for; but the Fuel Research Board are not satisfied that any of the processes so far experimented with is satisfactory commercially. At the same time, one cannot speak categorically and adversely of new developments—such as low-temperature carbonization by the heat being internally applied in producer or retort. However, Mr. Clynes realizes that the essential changes necessary to prevent smoke altogether will take long to produce. "Domestic smoke will not be abolished in a day or two by Act of Parliament. But public opinion can urge the adoption of means which shall steadily diminish the evil until it is finally eliminated." If it does, so much the better for heating by gas.

The Summer Time Act.

The Early Closing Association are appealing for the co-operation of all municipal bodies and trade organizations in support of the reintroduction of "summer time." In a resolution, the Board of Management of the Association state that they are gratified to learn that the Government intend to reintroduce the Summer Time Act in March; and seeing that no class of the community has benefited more than the 1¾ millions of shop workers throughout the country by this beneficent Act, they urge all public bodies and trade institutions to pass, without delay, resolutions supporting the plans of the Government.

The Gas Coal Position.

From most of the coalfields, reports tell us that there has been a brightening-up of the gas-coal market. In the northern fields, there are more pressing requests for supplies, with the result that prices are firmer, where there had been a drooping tendency before. Besides, more business is being done for shipment to gas-works abroad. Large coal and nuts are going off very freely, and so are the best screened sorts; the secondary grades being consequently the more abundant. Many gas-works have a preference for the former with high transport costs ruling. Heavier deliveries are now being made on contracts; and there is rather less buying in the open market.

Gas Coal Exports.

The quantity of gas coal shipped last year, despite the coal strike, was greater than in 1920. Had it not been for the strike, it would no doubt have been considerably more. A noticeable feature is that the South American trade is being recovered. The total quantity of coal exported last year was 24,860,552 tons, of which 3,740,744 tons is classified as gas coal, which figure compares with 2,204,571 tons in 1920, and 11,527,686 tons in 1913. In the two last-named years, the total coal exports were respectively 24,931,853 tons and 73,400,118 tons. The total values of the gas coal exported in the three years were: 1921, £6,795,552; 1920, £8,682,503; and 1913, £7,154,427. The values of the total coal exported are stated as: 1921, £42,951,591; 1920, £99,627,146; and 1913, £50,727,252.

Overseas Trade in Gas Coke.

Last year 443,565 tons of gas coke were shipped abroad; the value being £918,081. In 1920, the quantity exported was 770,265 tons; the value then being £4,751,605. Comparison of these figures is interesting. The quantity of gas coke exported last year, of course, suffered through the coal strike; and the fall in the price of coal following the strike has also had an effect. The average of £6 or so per ton of gas coke in 1920 is something which will long be remembered by some fortunate gas undertakings; but it is not likely to return.

Sulphate of Ammonia Exports.

According to the Board of Trade returns, the quantity of sulphate of ammonia exported in 1921 was 128,433 tons, compared with 109,620 tons in 1920. The improvement is welcome; but the quantity is not one with which there would have been satisfaction before the war. The home trade, however, has provided large compensation—quantitatively, though the price has dropped so heavily.

Gas and Other Oil.

The quantity of petroleum products imported into this country last year reached the grand total of 1,061,456,989 gallons, compared with 875,199,000 gallons in 1920, or an increase of 186,257,989 gallons. Of gas oil, 76,826,082 gallons were imported last year, against 53,564,775 gallons in 1920. The increase was 23,261,307 gallons, or 43·4 p.ct., which shows the effect of lower price upon demand and use for water-gas purposes. Although the quantity increased so largely, the value of last year's imports of gas oil is placed at £2,474,098, compared with £3,350,570 for the smaller quantity of 1920. The amount of fuel oil received was 533,131,807 gallons, compared with 347,771,044 gallons in 1920. These figures again tell a tale; but they include considerable quantities of crude oil that have been received in Wales and Scotland for refining purposes. The imports of motor spirit mounted up to 251,098,155 gallons, compared with 206,910,704 gallons in 1920.

Gas Light and Coke Company's Dividend.

We are informed by the Secretary (Mr. W. L. Galbraith) that the accounts of the Gas Light and Coke Company for the past year show that the balance to the credit of the net revenue account will enable the Directors to recommend the payment of dividends for the half year to Dec. 31 last at the rate of 4 p.ct. per annum on the 4 p.ct. consolidated preference stock, at the rate of 3½ p.ct. per annum on the 3½ p.ct. maximum stock, and at the rate of £4 13s. 4d. p.ct. per annum on the ordinary stock—carrying forward to the next account the sum of £144,357 0s. 5d. A year ago the dividends were at the rate of £2 12s. 6d. p.ct. per annum on the 3½ p.ct. maximum stock, and at the rate of 3 p.ct. on the ordinary stock—carrying forward £326,597 19s. 3d.

American Gas Industry Curves.

There is made every five years by the United States Census Bureau a statistical report upon the manufacturing industries; and some figures from the latest issue, which will cover the calendar year 1919, have already been issued, though they are subject to correction later on in the final statistics. A chart showing the growth of the gas industry indicates that over the past twenty years the rate of increase has amounted to about 7 p.ct. per annum. In some years it has been greater than 10 p.ct., and in others less than 5 p.ct. Another chart discloses some marked changes in the kinds of gas manufactured. For instance, mixed coal and water gas has increased over 100 p.ct. in each of the five-year periods 1909-14 and 1914-19. Straight coal gas has declined very abruptly. From 1914 to 1919, the quantity of carburetted water gas made remained the same. Comparing prices of materials in 1914 and 1919, the following increases are shown: Coke, 90·5 p.ct.; coal, 67·5 p.ct.; oil, 67·5 p.ct. In the same period, however, the increase in the price of gas for domestic consumption was only 46 p.ct.

"Fuel in Science and Practice."—Edited jointly by Prof. R. V. Wheeler and Dr. J. V. Elsden, there has been issued the first number of a supplement to the "Colliery Guardian" which is intended to constitute a monthly record of British and foreign research regarding the preparation and use of fuel. There is a "foreword" by Sir George Beilby, F.R.S., Director of the Fuel Research Board, as an earnest of his interest in this attempt to place before the users of fuel, in its various forms, a periodical account of contemporary research. The number also includes articles by Mr. S. R. Illingworth, on "Coal and Its Carbonization;" by Dr. R. Lessing, on "The Study of Mineral Matter in Coal;" by Mr. F. S. Sinnatt and Mr. L. Slater, on "Producer Gas from Pulverized Fuel;" and by Dr. R. V. Wheeler and Mr. R. Wigginton, on "Resins in Bituminous Coal."

Gas-Engines in 1921.—In the "Engineering Section" of "The Times Trade Supplement," a review of the progress of internal combustion engines in 1921 appears. The greater part is devoted to the Diesel type of engine. As to gas-engines, it is said that little that is new has to be recorded in connection with them. The demand for large horizontal motors running on blast-furnace gas, such as were built by Vickers and others in 1920, fell away considerably, although it is believed there will be a wide market for this type when prosperity returns again to the iron and steel industry. If the prices of coal and oil maintain their present level, it is probable that a new lease of life will be given to the gas-engine, the relation of which to the oil-engine is very different from what it was in 1920, when coal was much more expensive. There appears to be an increasing demand for gas-producers and gas-engines using refuse fuel. Most of the inquiries are coming from abroad, and many gas-engine manufacturers are now building a producer more or less specially adapted for operation on wood shavings, rice husks, and other waste products.

PERSONAL.

Sir JAMES FARQUHARSON REMNANT, Bart., M.P., has been elected to a seat on the Board of the Continental Union Gas Company, Ltd., rendered vacant by the death of Sir Arthur Lucas.

Mr. EVAN REES, who in March is taking up an appointment in connection with the Wandsworth, Wimbledon, and Epsom gas undertaking, received his training at Neath under Mr. R. A. Browning, with whom he was associated in the reconstruction and management of the Neath Corporation Gas-Works. In 1907, he became Engineer and Manager to the Brynmawr and Blaina Gas-Works, the plant of which doubled its capacity during his management. In 1914, Mr. Rees was chosen out of 132 applicants to carry out the erection of the new gas-works for the Margam Urban District Council, to the plans and specifications of Mr. Frank H. Jones, the Consulting Engineer to the Council. Mr. Rees subsequently became Manager of the works, and remained in this position until the Council became merged recently in the new borough of Port Talbot, when he was offered the Managership of the combined undertaking.

On the 26th ult., at the Middle Temple, though but 22 years of age, Mr. GEORGE JULIUS WEBBER, a son of Mr. Joseph Webber, Managing Director of the Provincial Incandescent Fittings Co., Ltd., was called to the Bar. Special leave had been granted to a petition lodged in consequence of Mr. Webber having so successfully distinguished himself at the recent Bar Final Examinations, when he obtained a studentship of 100 guineas per annum tenable for three years, in consideration of gaining a first of firsts out of 134 students from all quarters of the British Empire. This was a truly remarkable achievement.

The Smethwick Corporation have appointed Mr. E. HARDIKER, F.C.S., Engineer and Manager of the gas-works as from to-day, at a salary of £700 per annum. Mr. VINCENT HUGHES is to be retained as Consultant to the gas undertaking at a salary of £200 per annum.

Mr. ALEXANDER YOUNG, a native of Arbroath, who is at present engaged at the Dundee Gas-Works, has been appointed by the Tayport Town Council as their Gas Manager. Mr. Young, who is about 28 years of age, served his apprenticeship with an Arbroath engineering firm.

The Scunthorpe and Frodingham Urban District Council received 54 applications for the position of Gas Manager rendered vacant by the resignation of Mr. S. MOORE; and Mr. J. S. SIMPSON, of Nelson, has secured the appointment, to which is attached a salary of £500 per annum.

At a meeting of the Port Talbot Town Council last Wednesday, Mr. A. J. BOND was appointed Gas Manager at a salary of £500 a year, in place of Mr. Evan Rees (the former Margam Manager) who had not accepted the office owing to securing a position at the Wandsworth Gas-Works.

Mr. STANLEY SADLER, Manager of the Solihull Gas Company, near Malton, Yorkshire, was married last week, at Malton, to Miss Adeline E. Whisker, of that town. Mr. Frank Sadler, cousin of the bridegroom, was the best man. The ceremony was of a very quiet nature.

Mr. ALEX. MACKAY, Chief Engineer of the Stoke-on-Trent Corporation Gas Undertakings, is this year President of the North Staffordshire and District Caledonian Society. A few days ago, the 163rd anniversary of the birth of Burns was celebrated by a dinner at the North Stafford Hotel, Stoke. On the occasion, Mr. Mackay presided; and among the guests was Bailie W. B. SMITH, of Glasgow.

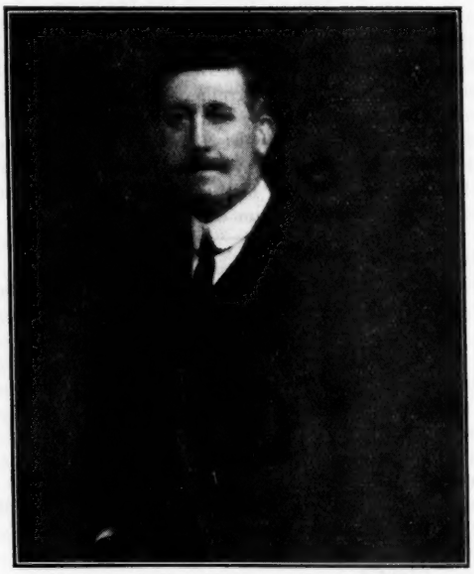
Producer Gas Power Plant.—Owing to the pressure on the time at the last meeting of the Institution of Mechanical Engineers, the discussion on a paper by Mr. H. S. Denny, C.B.E., and N. V. S. Knibbs, entitled "Some Observations on a Producer Gas Power Plant" is to be taken on Friday of this week at 6 p.m.

Gas for Fish and Potato Frying.—A new system of heating for fish and potato frying is described and illustrated in the current number of "A Thousand-and-One Uses for Gas," published by the British Commercial Gas Association. The arrangement consists of a battery of powerful natural draught gas-burners, so designed that it can be fitted in the furnace space at present used for solid fuel. With these burners, frying can be commenced a few minutes after lighting-up; and during slack periods some of the burners can be turned out, which, of course, results in economy. The burners are of the multi-headed type, because with fish frying it is essential that the heat supplied should be distributed as evenly as possible over the surface of the pan. The heating operation is carried out mainly by flame contact, but partly by the heat radiated from the brickwork of the furnace. In the district of the South Metropolitan Gas Company a number of the existing coal-fired fish-friers have already been converted with complete success to the use of gas at ordinary pressure; and the conversion of others is in hand. The multi-headed burner is placed in the firebox, with the tops of the burner-heads about 4 in. from the bottom of the pan. The cost of conversion is stated to be reasonably low. Installations of frying apparatus of various sizes are illustrated.

THE LATE MR. ISAAC CARR.

JUST before going to press with last week's issue of the "JOURNAL," the sad intelligence came that Mr. Isaac Carr, M.Inst.C.E., the Corporation Gas Engineer of Widnes, had passed to his last rest. We were then able to record the fact, and to express our sorrow and sympathy, together with a brief appreciation of our friend and of his life's work. We may just repeat that the death of Mr. Carr occurred in the Liverpool Nursing Home, on Friday, the 20th ult., following an operation which had been performed the previous Tuesday. He was only 64 years of age, but until a few weeks before his death (during which he had been in failing health), his activities were up to their accustomed high standard.

To-day we must supplement the previous reference by a few further particulars of Mr. Carr's association with the gas industry. His age will have informed our readers that Mr. Carr was born in the year 1857. Stalybridge was his native town. His professional career commenced under the late Mr. Thomas Newbigging, M.Inst.C.E.; and his practical engineering training was obtained in the works of Messrs. Robert Dempster & Sons, of Elland. His first official post was at Todmorden, where he went as the Manager of the gas-works. He vacated that position to become Assistant Gas Manager at Leeds, whence he came south to the Portsea Island Gas Company. Again he went north; being appointed Assistant Engineer to the South Shields Gas Company. It will be seen from this that Mr. Carr in his early official life



THE LATE MR. ISAAC CARR, M.Inst.C.E.

had a large and varied experience in all sorts of circumstances; and this fitted him for the distinguished part he was to play in making Widnes for many years the town which could boast the cheapest gas supply in the world. Although he had had such a large experience, it had been compressed into comparatively few years; for when he journeyed from South Shields to take up the appointment at Widnes in 1882, he was then only 25 years of age.

At the time Mr. Carr entered upon his duties at Widnes, the make of gas per annum was only about 62 million c.ft.; and the price was 3s. 6d. per 1000 c.ft. The number of consumers was then only 700. But he leaves the undertaking with an annual output of 500 million c.ft.; and the selling prices—even in these days of high costs for raw materials, labour, and all other items of expenditure—are 2s. 3d., 2s. 1d., and 1s. 11d. to 1s. 6d. for motive power. As we have said, Mr. Carr made Widnes famous throughout the gas world for the lowness of the price of its gas. This was due to circumspect management, wise dealing in finance, and the purchase of gas-making material from which the maximum economy in the circumstances of the Widnes undertaking could be derived. Mr. Carr was, in the fullest sense, a gas engineer and a manager. For a quarter of a century at least, gas was sold in the town at a less price than that of any other gas undertaking; but there was a temporary breach in this enviable position. During the latter period of the war, gas-works on the North-East Coast (together with a few other places) were permitted to ship coke abroad at enormous prices—a privilege withheld from all Lancashire gas-works. The result of this was that Widnes receded for a space from the premier position in the matter of selling price. However, with the return of more normal conditions, Widnes is again in the forefront of low selling prices; and it again boasts the lowest charge per 1000 c.ft. in the world.

Mr. Carr had a considerable Parliamentary practice and experience in connection with gas matters; and prominent in this part

of his professional work as a consulting gas engineer stands his representation of the London County Council in questions connected with the change from the No. 1 to the No. 2 standard testing-burner, and the lowering of the illuminating power, and the setting-up of a standard of calorific power, for the gas supply of certain areas in the Metropolis. We see him now in the witness chair before many Committees—expressing his views with strength, and defending them with tenacity. Sometimes those views were not in harmony with those of the major part of the gas profession; but although Mr. Carr could on these occasions be forcible in expression, vehement in his denunciation of those who were at that time working with a view to reducing the quality of gas in respect of luminosity or calorific value per cubic foot, there was something that one could not help admiring about our late friend. With it all, one could see how strong were his convictions; and, as one looks back, it can be seen how consistent in his views was Mr. Carr from the beginning to the end of that great and wordy warfare. Whether or not one agreed with him (we ourselves were not always in agreement with him), the fact did not constitute any reason in his mind for any breach of friendship. He treated these matters as differences of opinion in policy, and not as differences that should cause any estrangement between one man and another. What he did object to, and what annoyed him, was anything that appeared to him to be "hitting below the belt."

Parliamentary work, however, was only one side of his consulting practice. He was consultant to many gas and water undertakings. Among them were the Plymouth Corporation Gas-Works, the West Cheshire Water Company (Birkenhead), the Ripon Corporation, Newry Urban District Council, the Sutton and Hooton Gas Company, the Liverpool Corporation, St. Annes-on-Sea Gas Company, and several others. He was also responsible for the laying-down and the construction of many new gas-works in various parts of the country.

Besides being a member of the Institution of Civil Engineers, Mr. Carr was long a member of the Institution of Gas Engineers, as well as of the Manchester District Institution of Gas Engineers. He was a great believer in professional organizations for the debating of matters appertaining to professional practice; and he always liked to be, whenever possible, among his professional fellows taking part in formal debates or discussions.

In professional circles Mr. Carr will be greatly missed, for by his energy, his activities, and his pronounced views, he had made himself a distinctive place in their ranks.

THE FUNERAL.

The funeral took place at the Anfield Crematorium, Liverpool, last Saturday week; but prior to this a service was held at Farnworth Parish Church. Among those attending the funeral were the following: Capt. W. M. Carr, eldest son and partner in consulting practice, also Engineer and Manager of the Ormskirk District Gas and Electricity Company; Mr. James Carr, M.C., and Mr. Edward Carr, sons; Mr. E. H. Buckley, of Millford, Stalybridge, brother-in-law; Mr. J. Mitchell Moncrief, M.Inst.C.E., brother-in-law; M. André Lyonnet, Paris, son-in-law; Mr. S. Tagg, representing the President of the Manchester Institution of Gas Engineers; Mr. G. S. Frith, of Runcorn, Hon. Secretary of the Manchester Institution; Mr. R. E. Gibson, Chief Engineer of the Liverpool Gas Company; Mr. W. Newbigging, of Manchester; Mr. Godfrey W. Kaye, Secretary of the Manchester Gas Department; Mr. J. H. Crowther, of Wallasey; Mr. W. E. Roberts, of Woolton; Mr. J. W. Scott (R. & J. Dempster & Sons, Ltd.); Mr. R. Lamb (Messrs. Macpherson & Co.); Mr. D. Ingram, of Liverpool, late of Widnes; Mr. J. H. Brearley, M.Inst.C.E.; Mr. H. Lupton, of Leeds; Mr. W. Bennett, of Mossley; Mr. H. E. Kendrick, of Stretford; Mr. W. Pease, of Halifax; Mr. C. Peeks, of Rainhill; Mr. J. Beswick, of Manchester; Mr. Blair (Messrs. W. & B. Cowan, of Manchester); Mr. J. H. Davies, of Oswaldtwistle; Mr. C. Cliffe, of Little Sutton; Mr. Hall, of Prescot; the Mayor of Widnes (Mr. Councillor P. Caldwell); Mr. Alderman H. Sutton Timmis, the Chairman of the Widnes Corporation Gas and Water Committee; Mr. C. E. Dickinson, Assistant Gas and Water Engineer; members of the Widnes Corporation, and the heads of the Corporation Departments.

A Gas-Heated Steam Pressure Cooker.—The Albert Sechrist Manufacturing Company, of Denver (Colo.), have placed on the market a gas-heated steam pressure cooker which apparently performs domestic cooking quickly and satisfactorily. The pressure cooker is a steam-tight vessel, with a safety valve that lifts at 25 lbs., and a steam gauge that registers the amount of pressure. It is so made that it is practically fool-proof; and even high-school girls are said to be using it in many domestic science departments.

Ammonia and Its Stability in the Coke-Oven.—At a meeting of the Midland Section of the Coke-Oven Managers' Association at Leeds University, Mr. H. J. Hodsman read a paper in the course of which he pointed out that ammonia of synthetic origin was now in a position to enter the market at least on terms of equality with bye-product ammonia, and might well in the future dominate the market as regards supply, quality, and price. The German production of synthetic ammonia reckoned as sulphate was in 1920 nearly four times the total British production; and this showed the importance of studying the properties of ammonia and the factors governing the efficiency of its recovery.

ELECTRICITY SUPPLY MEMORANDA.

In the current issue of the "Engineering Section" of "The Times Trade Supplement," there is a review of electrical engineering during last year; and towards the end some general remarks are made regarding domestic electrical appliances. It is because they are "general," and not particularly definite, that they are interesting. One's point of view is sometimes best served by being superficial and indefinite; and though there may be something misleading about what is said, if a charge to that effect is made, it is easy enough to point out in reply that no particulars or data were given. It is said in the article that unusual interest attached during the past year to the domestic market for electrical goods. We agree, but not for the same reasons which the writer of the statement affixes to it. A distinct advance, it is said, was made towards persuading the public of the advantages, in respect of efficiency as well as health and convenience, of making more general use of electricity in the home. The evidence of this has not been very striking. What has been evident is that people were not prepared to pay the high cost of appliances, of installation, and of electrical heating energy. Prices for 3420 B.Th.U. ranging between 1½d. and 4d. are not a very attractive proposition for the householder. The writer of the article says that "the sale, for example, of electric fires during the present winter has probably been the largest on record." That word "probably" is a useful safeguard. We cannot imagine people being so foolish as to pay for heating electrically the prices that have been ruling of late; and there appears to be something beautifully imaginative about the assertion. It may be that "the difficult conditions created by the coal troubles early in the year had some influence in this direction." But we can hardly credit it, because the strike did not take place in cold weather, and there was a big space between the termination of the strike and the winter, during which coal came down in price and supplies were plentiful. Moreover, the trend of gas prices was also downward. However, the article acknowledges that there is a very wide margin to be filled up, as represented by the difference between the number of people who use electricity for heaters, vacuum cleaners, and other apparatus, and those who are quite able to afford to do so.

Strong Imagination.

Apathy.

The writer proceeds to remark that the manufacturers of domestic electrical appliances are preparing to make the most of their prospects. Naturally! They would be very bad traders if they were not. But we are told they have still some reason to complain of the lack of corresponding activity among many of the supply authorities. The charge as to the lack of activity has been made very frequently of late—indeed, so much so that it is a little wonderful that the writer of the article has had the conscience or temerity to speak, even vaguely, of the progressive doings of the past year and the present winter. From a high place in connection with the Electrical Development Association, there have been suggestions of apathy among many supply authorities, and of the absence of enterprising activity. The indictment has been seen in the electrical Press; and in papers and addresses before electrical organizations the same thing has been observed. Yet the charge does not alter the position. The apathy persists. And so the writer of the article before us has plenty of supporters. He has one in Mr. Norman Deykin, the President of the Birmingham and District Electric Club, who said in the Presidential Address he delivered recently that there was a dearth of good electrical showrooms in the country. He finds that the chief objection to electrical demonstration rooms is that they involve municipal trading; and he suggests that they should be run for demonstration, and the inquiries be handed over to the legitimate traders. There is not much incentive where this is the practice; and it is not quite the same thing as, after providing the attraction, getting the reward of direct custom. Of course, this charge of apathy cannot be said to be of general application; there are very live electricity suppliers who do all sorts of things to obtain domestic custom. But some of those who have tried earnestly have, after the first successes, been met with bitter disappointments—in that costs and low efficiency, particularly in heating operations, soon mark out the limits. Nevertheless, in some areas there is notable electrical keenness that is maintained by the men who are appointed for the job of creating business. Of course, where this is not the case, the gas industry does not complain. Where, however, keenness does exist, it has the effect of stimulating the gas suppliers; and the signs are that electrical keenness will with reduced prices be on the up grade; and this will have to be met by the gas undertakings concerned. They must not allow themselves to be lulled to sleep by the proclaimed electrical inactivity. All they ask for is, where there is municipal trading, that competition shall be pursued on commercial terms; and in all cases that there shall be fairness in statement respecting the rival agent—gas.

Financing Electric Appliance Sales.

There has lately been much advocacy of the hire-purchase system in the electricity supply industry. This is due to the heavy cost of electric appliances, which few householders can afford; and those who can afford them

find comparison with other appliances using another heating agent is well against the electrical variety. So the deferred payment plan is a refuge in the days of great need; and it is hoped the temptation to purchase that is provided in this way will be efficacious. But a new scheme is now appended to hire-purchase. Messrs. Hawkins & Co., Ltd., of Charing Cross Road, we see have inaugurated a scheme to finance deferred payments for dealers in the firm's electric ranges, washers, and vacuum cleaners. What the firm has done is to make arrangements with the Financial Trust Company, Ltd., by which dealers who submit satisfactory credit references will be enabled to finance, without drawing on their own capital, sales of electric ranges, washers, and vacuum cleaners—the deferred payments running over a period of twelve months. The scheme (the "Electrical Times" explains) enables the dealer to sell the goods to his customers—taking a small cash payment, and executing a time-payment contract under which the purchaser agrees to pay, in addition to the initial cash deposit, twelve monthly instalments. This contract (the due performance of which must be guaranteed by the dealer), together with the deposit, is forwarded to the Financial Trust Company, who (if all is satisfactory) issue instructions for the dispatch of the goods ordered. Thirty days later 50 p.ct. of the dealer's profits is remitted to him, and the remaining 50 p.ct. sixty days later. Our contemporary ends its explanation with the remark that the experiment will be followed with great interest by all sections of the trade. We may add, "and by others." One thing that strikes us about it is that the arrangement introduces a third party who will require a profit for the accommodation afforded. The manufacturer wants a profit, so does the dealer, and so will the Financial Trust, Ltd. The purchaser of the appliance will have to supply the profit to all three. As an example, for a washing-machine the initial payment is £15; and the monthly payments are £3 6s. 8d.—making in all £55. How many householders will be prepared in these times to add a definite additional expenditure of over £1 1s. a week for a twelvemonth for a single article like an electric washer?

"Poison Gas."

The electrical papers, or rather some of them, are delighted with Prof. Bone and Dr. Haldane. Their delight is found in a hoped-for effect from the efforts of these two gentlemen to obtain a restriction of carbon monoxide in gas. The effect electrically desired is that the campaign of these gentlemen will result in a stemming of the still rising tide of popularity of gas as a domestic heating agent. The electrical interest is not by any means unprejudiced. If it were, the electrical journalists would give close study to the evidence that was placed before the recent Departmental Committee on Carbon Monoxide, as well as to the report issued by that Committee after a patient and thorough investigation. They might also peradventure confer some little consideration upon our comments on the subject of the recent "Times" correspondence. But they evade everything that is calculated to lessen the weight of the opinions of scientists, who know that carbon monoxide is poisonous, but have very little knowledge of what day-by-day experience has to teach. Some day perhaps a Bone or a Haldane will come along with an appalling list of accidental deaths due to voltages that are common in electricity distribution, will write to "The Times," and try to create an agitation in favour of a reduction. Most deaths attributable to gas—and they are few compared with the numbers of people using gas—are due to suicides or drunkenness. Eliminating these, the gas industry can show as clean a sheet as any industry in respect of fatalities. Dr. Haldane has advocated this restriction for the past quarter of a century; but Dr. Haldane cannot show by any authoritative data that the number of fatalities through town's gas has increased during that quarter of a century *pari passu* with the increase in the number of consumers or the increase in the use of gas. "Electrical Industries" says that "the average citizen will note that carbon monoxide is admittedly a danger, and that the gas companies are free to make the percentage of it as high as they please." The "average citizen" might also make a note of the fact that carbon monoxide is a valuable heating constituent of town's gas; and yet the gas suppliers voluntarily limit, in normal times, the proportion. In times of stress, the percentage increases. It did so during the war, and during the coal strike. Nothing remarkable happened in consequence. But the "average citizen" had good cause to be thankful to the gas suppliers for their ability to add enormously to the fuel supplies of the country, through the liberty that was conferred upon them by the Government. The electrical Press do not note these things, any more than do Dr. Haldane and Prof. Bone. Such recognitions and admissions would not be good for their case. We have pointed out these facts time after time; but our electrical contemporaries show a considerable want of frankness and a large fund of meanness in ignoring them.

Smoke from Electricity Station Shafts.

A short time ago we referred to a report by the Public Control Committee of the London County Council on the emission of smoke from electricity station chimneys—particularly from those of the Hackney, Hammersmith, and Islington Borough Councils. The Committee recommended that the sanction of the Ministry of Health should be sought to the taking of legal proceedings against the Hammersmith and Islington Councils. When the recommendation was brought before the Council in December, it was postponed; but last week it was again introduced. Then Hammersmith was removed from the recommendation; and Islington remains. If sanction is secured to the legal proceedings against the Council, they will have an opportunity of explaining the causes of their air-polluting action. Local authorities ought to be examples to manufacturers in ensuring proper combustion under their steam-boilers, and not offenders against the law in this respect.

Electricity Board for Greater London.

Parliament proposes, the Electricity Commissioners hold inquiries, but the administrators of electricity undertakings cannot be moved in solid formation to advance the schemes for consolidating and concentrating electricity generation. Predominant is their indifference to the whole matter. All that the majority of electricity undertakings desire is to be left free to work-out their own salvation, without interference from, or domination by, any central body. There have been two conferences convened for the purpose of taking steps for the formation of a District Board for the Greater London area; but at one of them (the "Electrical Review" states) out of seventy-nine undertakings concerned, only about a quarter were represented and expressed their views. Our contemporary falls heavily upon this "indifference" to so important an issue, which exhibits that "deplorable lack of industrial constructive effort which has been at the root of so much trouble in the industry." The "seventy-nine" and the "quarter" referred to above indicate to us a very large majority of administrators of electricity undertakings who are of opinion that they should be left alone; and resistance to compulsion is best shown by their passive attitude. There is to be a third conference to say whether or not a District Board shall be formed. However small the meeting, if there is a majority in favour, the members of the proposed Board will be at once elected. In view of this, those who do not want the Board should organize themselves, attend the meeting, and vote against the proposal. Then what would happen would rest in the lap of the Government. As time passes, it accentuates more than ever that Parliament has tried to force upon the electricity industry something that its greater part does not want.

LONDON AND SOUTHERN DISTRICT JUNIOR GAS ASSOCIATION.

The monthly business meeting of the Association last Friday evening, at the Westminster Technical Institute, S.W., in addition to being well attended by members, included a number of visitors well-known in the gas profession, as well as one who has for many years been an eminent electrical engineer, and who had promised to deliver a lecture upon a matter of the first importance. The chair was occupied by Mr. D. C. CROSS, of Lea Bridge, the Senior Vice-President, who, at the outset of the proceedings, expressed regret at the absence, owing to an attack of influenza, of the President (Mr. F. A. Frost).

The CHAIRMAN said it was his great pleasure to introduce to the members Mr. Hugh Seabrook, who was a principal in the firm of Sir Charles Bright and Partners. He was an electrical engineer of exceptional experience; and it was a matter for keen satisfaction to them that he should come down and address the Association. No doubt other members, like himself, had been looking forward for weeks to hearing the lecture. [Applause.]

GAS-WORKS AND THE PRODUCTION OF LIGHT, HEAT, AND POWER (GAS AND ELECTRICITY).

Mr. A. HUGH SEABROOK, M.Inst.Mech.E., M.Inst.E.E., then gave the address, which (with a report of the discussion) is reproduced on pp. 259-262.

Mr. S. B. CHANDLER, in subsequently proposing a hearty vote of thanks to the lecturer, pointed out that this was the second occasion upon which an electrical engineer had graced the platform of the Association. The subject dealt with that evening was, as different speakers had remarked, one mainly of a political nature. They must all appreciate the great trouble to which Mr. Seabrook had gone in placing before them such valuable matter. They must also congratulate themselves upon the excellent discussion that had taken place, and thank the visitors who had come along to give in this way the benefit of their experience.

Mr. W. GROGONO said he was pleased to have the opportunity of seconding the vote. The subject of the address must be of interest to them all. Gas-works plant was now largely driven by electrical power, which in most cases they generated themselves. In every way, what Mr. Seabrook had said deserved their most earnest consideration.

Mr. SEABROOK, in response, said it had been a great pleasure to take advantage of the opportunity to address the members.

Manchester and District Junior Association.—On Wednesday, Feb. 8, the members are to visit the works of Messrs. John Ruscoe & Co., Ltd., Albion Works, Hyde, Manchester. Great interest, we are sure, will be found in the works and the special tool productions of the firm. By their invitation, the members will take tea at the Blackshaws Café, Hyde, after which Mr. T. Albinson, B.Sc., will read a paper on the "Combustion of Coal."

SOME NOTES ON COMPLETE GASIFICATION AND COMBINED GAS AND ELECTRICITY UNDERTAKINGS.

By HARALD NIELSEN.

In the Technical Journals of late, many extravagant statements have been made regarding high yields per ton of coal of 50,000 to 60,000 c.ft. of gas of calorific values well over 400 B.Th.U. per cubic foot; but unfortunately no means are given or indicated by the correspondents to facilitate the checking of their statements. Therefore, most people are more or less at sea, and have to take all on trust—only later on to find out perhaps that the stated efficiency of the complete gasification plant is one thing, and the practical efficiency quite another.

It is useless to deny the fact that a complete gasification process is more than a glorified gas-producer process. Consequently, a higher thermal efficiency cannot be obtained in the former than in the latter case, if the gas-producer process is run on up-to-date lines—that is to say, at round about 80 to 85 p.ct. maximum efficiency.

Taking ordinary modern producer-gas practice, about 150,000 c.ft. of gas at 135 B.Th.U. per cubic foot net will be produced from bituminous slack of (say) 13,000 B.Th.U. per pound. The total B.Th.U. recovered in gas in the cold state are about 20,000,000 per ton of coal.

When treating the same coal in a complete gasification plant, it is claimed that the total B.Th.U. recovered in the higher calorific gas are also about 20,000,000 per ton of coal. As the loss in the sensible heat of the gases and the radiation and convection losses are of about the same magnitude in each case, where does the heat come from that is represented by the carbon dioxide contents of the blow gases in the complete gasification process? If the values of 50,000 c.ft. at 400 B.Th.U. are correct, nothing is left for the blow gas, which is not quite consistent with ordinary practice. Obviously something must be radically wrong; and the writer feels inclined to think that the volume of gas claimed—viz., 50,000 c.ft.—is far too high, and is probably more in the neighbourhood of 35,000 to 40,000 c.ft. He believes in efficiencies of 99 p.ct., but not in 101 p.ct.

Prof. Cobb and Dr. Parker, in their extremely interesting and able report on ordinary water-gas practice at the Birmingham Gas-Works (as recorded in the "JOURNAL" last June), clearly indicated what really happens in ordinary practice. It will be found that the temperatures and proportions indicated in the following calculations or analysis of a complete gasification process correspond reasonably closely to theirs—at any rate, closely enough to provide a parallel for gas engineers desirous of investigating complete gasification from a theoretical point of view before deciding one way or the other.

In the "JOURNAL" for Nov. 9 last, the writer drew attention to a method widely adopted on the Continent—viz., the production of a blow gas of a certain minimum heating value, so that it could be utilized for the generation of electrical power. That it is quite possible to obtain such a blow gas of a heating value approaching blast-furnace gas, is manifested by daily occurrence, and is also quite evident from the calculations. Consequently, the gas can be either burned under steam-boilers or direct in suitable internal-combustion engines. It is also clear that, from a municipal gas and electricity point of view, a combined complete gasification process with an economical utilization of the blow gas will be able to sell gas therms and KW.-hours much cheaper than by any present known method.

The writer, in adopting the metric system and heating values throughout the calculations, has tried to make everything as clear and simple as possible.

THERMAL BALANCE-SHEET

Relating to the Distillation of a Bituminous Slack in a Rotary Retort by means of the Sensible Heat of Water Gas produced from the Resultant Semi-Coke.

NOTE: All heating values of combustible gases are net values; all weights and volumes are calculated at 0° C. and 760 mm.; 1 kilogram-calorie = 3·96 B.Th.U.

Analysis of Raw Bituminous Coal.

	P.Ct.	
Proximate—		
Moisture	2·8	Heating value = 6333·3 kg.cal. per kg. = 11,400 B.Th.U. per lb.
Volatile matter	31·1	
Fixed carbon	53·7	
Ash	12·4	
	100·0	
Ultimate analysis—		
Carbon	68·0	
Hydrogen	4·0	
Oxygen	9·7	
Nitrogen	1·3	
Sulphur	1·8	
Moisture	2·8	
Ash	12·4	
	100·0	

Analysis of Water Gas.

	P.Ct.	Cub.M.	Kg.	Kg.Cal.
CO_2	4·2	= 0·042	at 1·979 × 12/44	= 0·0227
CO	43·5	= 0·435	at 1·259 × 12/28	= 0·2355
CH_4	0·6	= 0·006	at 0·716 × 12/16	= 0·0033
C_mH_n	0·04	= 0·0004	at 1·250 × 24/28	= 0·00043
H_2	47·12	= 0·4712		
O_2	0·4	= 0·0004		
N_2	4·5	= 0·045		
	100·00		Total carbon per cub. m. of gas	= 0·26193

Heating Value of Water Gas, Net.

	Cub.M.	Kg.Cal.	Kg.Cal.
CO	0·435	at 3,018	= 1320
CH_4	0·006	at 8,531	= 51
C_mH_n	0·0004	at 14,000	= 5·6
H_2	0·4712	at 2,537	= 1193
Total net heat value			= 2569·6

Corresponding to 294 B.Th.U. per cubic foot.

	Kg.Cal.
Heat of formation per cub.m. of water gas (theoretical water gas = 50 p.ct. CO + 50 p.ct. H_2)	− 650
CO + H_2 according to gas analysis: 43·5 p.ct. + 43·5 p.ct. (3·62 p.ct. H_2). = 0·87 m³. 0·87 × − 650 kg.cal.	= 565·00
H_2 3·62 p.ct. = 0·0362 cub.m. × 2622 kg.cal.	= 91·20
Total endothermic reactions	656·20

	P.Ct.	Cub M.	Kg.Cal.	Kg.Cal.
CO_2	4·2	= 0·042 ×	4395	= 184·5
CH_4	0·6	= 0·006 ×	995	= 5·97
Total exothermic reactions				190·47

	Kg.Cal.
Heat deficiency in the production of 1 cub.m. of water gas: 656·20 − 190·47	= 465·73

To this must be added the corresponding heat value of the sensible heat carried away by the water gas, leaving the producer at a temperature of about 400° C.

	Kg.Cal.
400 × 0·31	= 124·00
(Total heat required for the water-gas production under the above conditions)	= 589·73

Analysis of Blow Gas.

	P.Ct.	Cub.M.	Kg.	Kg.Cal.
CO_2	8	= 0·08	at 1·979 × 12/44	= 0·0432
CO	20·8	= 0·208	at 1·259 × 12/28	= 0·1122
CH_4	0·5	= 0·005	at 0·716 × 12/16	= 0·0027
H_2	3·5	= 0·035		
O_2	0·4	= 0·004		
N_2	66·8	= 0·668		
	100·0		Total carbon per cub.m.	= 0·1581

Heating Value of Blow Gas.

	P.Ct.	Cub.M.	Kg.Cal.	Kg.Cal.
CO	20·8	= 0·208 ×	3018	= 631·0
CH_4	0·5	= 0·005 ×	8531	= 42·6
H_2	3·5	= 0·035 ×	2537	= 89·0
Total heat value per cub.m.				= 762·6

Corresponding to 86·4 B.Th.U. net per c.ft.

Heat of Formation of Blow Gas.

	P.Ct.	Cub.M.	Kg.Cal.	Kg.Cal.
CO_2 =	8·0	= 0·08	at 4395 per cub.m.	= 352·00
CO =	20·8	= 0·208	at 1325 ,,	= 276·00
CH_4 =	0·5	= 0·005	at 995 ,,	= 4·95
Total exothermic reactions per cub.m.				632·95
H_2 = 3·5 p.ct. = 0·035 cub.m. at 2622 kg.cal. per cub.m. (Total endothermic reactions.)				= 92·00
Net surplus heat of formation per cub.m.				= 540·95

The net surplus heat has to heat up the amount of coke required

for the production of 1 cub.m. of water gas, *plus* the corresponding amount of blow gas.

Water Gas.

	Cub.M.
Amount of water gas produced per kg. coke	= 1·10
Blow gas produced	= 2·67
Total gas	= 3·77
Ratio: $\frac{\text{Blow gas}}{\text{Water gas}} = \frac{2·67}{1·10}$	= 2·43

Mean reaction temperature corresponding to gas analysis = 960° C.

Amount of coke per cub.m. of water gas $\frac{1}{1·10}$ = 0·91

Heat required per cub.m. of water gas.
Coke 0·91 × (960 − 15) × 0·22 (specific heat) = 189·2 kg.cal.
Steam requirement (hydrogen content in gas) = 0·382 kg.
Steam conversion: 70 p.c.

Total steam = $\frac{0·382}{70 \text{ p.c.}}$ = 0·545 kg. of steam per cub.m., to be superheated from 150° C. (4½ atmos.) to 960° C.

0·545 × (960 − 150) × 0·48	= 212 kg.cal.
Reaction steam only: 0·382 × (960 − 150) × 0·48	= 148·5 ,,
Difference	63·5 ,,

Free Moisture.

	P.Ct.	Kg.Cal.
(*a*) Water value: (0·91 × 1·9) × (100 − 15)		= 1·47
(*b*) Latent heat: (0·91 × 1·9) × 537		= 9·3
(*c*) Superheat: (0·91 × 1·9) × (960 − 150) × 0·48		= 6·72
		17·49

Combined Moisture.

(2·91 × 0·055) × (960 − 100) × 0·48 = 21·00 kg.cal.

Radiation losses and convection losses.
0·9 p.ct. on fuel value = 58 kg.cal. per kg. coke,
or: 58 × 0·912 = 53 kg.cal. per cub.m. water gas.

Heat Balance per Cub.M. of Water Gas.

(*a*) CONSUMED.

	Kg. Cal.
Water-Gas Formation.	
Heat of formation	465·73
Superheat up to 400° C.	124·00
Coke.	
Raising of temperature to reaction temperature of the amount of coke corresponding to the production of 1 cub.m. water gas = 0·91 kg.	189·20
Free Moisture.	
Total kg.cal. carried away by 1 cub.m. water gas	17·49
Combined Moisture.	
Superheat of same up to reaction temperature per 1 cub.m. water gas	21·00
Steam Requirement.	
Superheating of reaction steam up to reaction temperature	212·00
Radiation and Convection Losses.	
Reduced to total losses per 1 cub.m. water gas produced	53·00
Total heat required per 1 cub.m. of water gas formed	1082·42

(*b*) AVAILABLE.

	Kg.Cal.
Heat of formation of the amount of blow gas corresponding to the production of 1 cub.m. of water gas = 2·43 cub.m. of blow gas	= 1315·00
Superheat of extra steam	= 63·50
Superheat of free moisture	= 6·72
Superheat of combined moisture	= 21·00
Total heat value	= 1406·22
Deduct requirements	= 1082·42
Balance representing sensible heat in blow gas leaving the producer	323·8

To this corresponds an outlet temperature of the blow gas of

$$\frac{323·8 \text{ kg.cal.}}{2·43 \text{ cub.m.} \times 0·31} = 429·4° \text{ C.}$$

Combustion of Blow Gas.

The maximum flame temperature obtained with the preheated blow gas (400° C.) is round 1250° C. The amount of air required for the complete combustion of

1 cub.m. blow gas + 10 p.ct. extra air is = 1 cub.m.

CARBONIZING BY THE SENSIBLE HEAT OF WATER GAS.

Average coke produced per ton of coal = 76·5 p.ct.
Corresponding amount of water gas produced from the resultant coke from the low-temperature carbonizing of 1 ton of bituminous slack:

1100 cub.m. × 0·765 = 840 cub.m. = 0·840 cub.m. per kg. coal.

	Kg. Cal.
Sensible heat contents of 0·840 cub.m. water gas at 400° C. when leaving at 150° C. = 0·840 × 0·31 × (400 − 150)	= 65·00
Steam superheated: 0·840 × (0·163 + 0·055 + 0·019) = 0·840 × 0·237 × 0·48 × 250	= 23·90
Available heat before superheat	= 88·90

1 kg. of the above coal requires 200 kg.cal. for low-temperature carbonizing at 600° C.

	Kg.Cal.
200 − 88·9	= 111·1

To be Provided by Superheating.

	Kg Cal.
By superheating the water gas from 400° to 800° C., we have:	
Extra sensible heat in gas: 0·840 × 0·31 × 400	= 104
Superheat of steam: 0·840 × 0·237 × 400 × 0·48	= 38·5
Total heat units carried by 0·84 cub.m.	142·5
	Kg.Cal.
Water gas available for carbonizing at 800° C.	= 231·4

(This allows for a drop in the short hot-gas main of 80° C.)
Blow gas must be combusted in order to provide 142·5 kg.cal.
Useful heat in blow gas after deducting initial heat value corresponding to that of the water gas entering the heater at 400° C. is about 105 kg.cal.
(762·6 − 105) × 0·6 (transfer efficiency) = 394 kg.cal. utilized per cub.m. of blow gas burnt.

Carbonizing by the Sensible Heat of Water Gas.

Ratio: $\frac{\text{Blow gas burnt}}{\text{Water gas superheated}} = \frac{394 \text{ kg.cal.}}{142·5} = 2·76$

Or, in order to provide the superheat for 0·84 cub.m. of water gas:
0·362 cub.m. blow gas must be combusted, or per cub.m. water gas:
$\frac{0·362}{0·84}$ = 0·431 cub.m.

Thus providing per ton of coal—

1100 cub.m. × 0·765 = 840 cub.m. water gas.
(2670 cub.m. × 0·765) − (840 × 0·431) = 1680 cub.m. blow gas.

The products of combustion leaving setting at 500° C., when cooled down to 250° C. (feed water economizer) contain:
[360 × (500 − 250) × 0·37] × 2 = 56,000 kg.cal.

WATER GAS CARBONIZING.

Recovered Kg. Cal. per ton of Coal.

Gas—	
(*a*) 148 cub.m. high cal. gas. at 6800 kg.cal.	= 1,005,000
(*b*) 840 cub.m. water gas at 2570	= 2,160,000
(*c*) 1680 cub.m. blow gas at 762·6	= 1,285,000
Total net kg.cal.	4,450,000
Tar Oils—	
18 gals. at 16,000 B.Th.U. = 81 kg. at 8900 kg.cal.	= 720,000
Total net heat recovery	5,170,000

Original heating value of coal
= 6333·3 × 1000 = 6,333,300 kg. cal.

Percentage efficiency: $\frac{5,170,000}{6,333,300}$ = 81·5 p.ct., without steam requirements.

Mixed gas obtained: 988 cub.m. = 34,800 c.ft.
Calorific value of mixed gas = 3200 kg. cal. per cub.m.
Corresponding to: 366 B.Th.U. net per c.ft., about 400 B.Th.U. gross.
Percentage of heating value of coal in high calorific gas
= $\frac{3,165,000}{6,333,300}$ = 50 p.ct.
Steam requirements: 0·545 kg. per cub.m. water gas
= 0·545 × 840 = 456 kg.
Containing: 456 × 650 = 297,000 kg.cal.
Corresponding to 4·7 p.ct. on heat value of coal, or total thermal efficiency = 81·5 − 4·7 = 76·8 p.ct.
Heat which can be recovered from sensible heat carried by:

	Kg.Cal.
(*a*) Unignited blow gas: 1680 cub.m. × 0·31 × (415 − 250)	= 86,000
(*b*) Ignited blow gas 720 cub.m. × 0·31 × (500 − 250)	= 56,000
Total recoverable kg.cal. at final temp. = 250° C.	= 142,000

NOTE: This recovered heat will provide power enough for the running machinery, &c. = 20 H.P.-hour per ton of coal carbonized.

ELECTRICAL ENERGY FROM BLOW GAS,

Produced per ton of coal (1680 cub.m. at 762·6 kg.cal.):

(*a*) Gas burned under boilers and steam raised and utilized in turbo-generators—

1 KW.-hour requires 7500 kg.cal. under this system.
Hence: $\frac{1680 \times 762·6}{7500}$ = 170 KW.-hours.

(*b*) Gas utilized in gas-engines—

1 KW.-hour requires 4000 kg.cal; hence:
$\frac{1680 \times 762·6}{4000}$ = 320 KW.-hours.

From the above, it will be clearly seen into what an extremely valuable bye-product the blow gas can be turned by properly designing the gas plant and running it in a rational way.

The Editor, in a note in the "JOURNAL" for Jan. 18 [p. 144] regarding the combination of gas and electricity undertakings, strongly and ably summarized the whole affair in a way which clearly indicates the proper course to take. Mr. A. MacGregor in the same issue offered some very sound criticism of existing gas practice when pointing to the possibilities of complete gasification plants.

GAS-WORKS AND THE PRODUCTION OF LIGHT, HEAT, AND POWER (GAS AND ELECTRICITY).

[An Address by Mr. A. Hugh Seabrook, M.I.Mech.E., M.I.E.E., to the London and Southern Junior Gas Association, Jan. 27.]

I am glad to have the opportunity of addressing a Junior Association on this subject, because a junior is generally more receptive of new ideas, and has probably not committed himself to definite opinions, as is the case with an "old stager." However, the junior of to-day is the old stager of to-morrow; and that is another reason for endeavouring to put a fresh line of thought into the mind of the junior.

I heard recently of a manager of a large gas-works who said that he would not have such a thing as an electric motor on his works. Such a state of mind as this is to be regretted, whether in a gas, electrical, or any other engineer. It is the mentality of the extremist; and we have seen during the last few years where the extremist leads his followers.

At its best, orthodoxy is dull. I am afraid I must plead guilty to a leaning towards the unorthodox; and I have no respect for any particular practice on the mere grounds that it is the usual practice. If I think it is wrong or can be improved, I am afraid I am liable to say so very frankly. A man who has spent a number of years in one particular branch of engineering, and who becomes associated with another branch, is sometimes able to look at the established practice of the latter from a somewhat different point of view from those engineers whose life work it has been.

For twenty-five years my particular branch of engineering was electrical, chiefly electricity supply. But during the last few years I have been associated with gas engineers; and from that association (which I regard as a most valuable and also a pleasant experience), I have obtained considerable insight into their methods and ideas. As a result I have come to the conclusion that there are great advantages to be obtained from a much closer association between gas and electrical engineers, principally in the direction of concentrating the production of light, heat, and power, whether in the form of gas or of electricity, at existing gas-works. I am quite aware that there is nothing particularly novel in the proposal. It has been done in a small way in several places with more or less success. I want, however, to see it carried a good many steps farther, because, properly developed, I believe there are great possibilities in it.

I am not going to make any reference whatever to the respective merits of gas or electricity, beyond saying that it is difficult to prove that either is of greater value to the community than the other. They are both essential public services of prime importance. I hope this closer association will result in the gas-works, or, as I would prefer to call them, gas-power stations, becoming as neutral, so far as the generation of light, heat, and power is concerned, as is the coal merchant. The coal merchant supplies coal impartially to practically every industry, without taking any particular interest in one as compared with another. Similarly, I believe the proper way to approach this problem is for the power stations to be concerned with the economical production of light, heat, and power, with no particular interest whether the consumer at the other end of the mains uses the service in the form of gas or electricity. It does not really matter to the combined power station. It will supply the consumer anyhow, whether he uses gas or electricity. It is entirely a matter of engineering, with coal conservation as its basis. It may be years before we see much progress in this direction, but I believe it is to the interest of everyone that a serious start should be made with the least loss of time.

It is not yet proved that it is more economical to produce light, heat, and power at colliery centres, and transmit by pipe or wires to centres of distribution, than to convey the coal by sea, road, or rail. If it is proved eventually that pipes and wires are cheaper, it does not affect my contention—which is that at whatever centre the coal is dealt with, that is the most suitable place for producing both gas and electricity.

A gas-works is found in the very smallest towns, even those of 500 inhabitants. It is also found that engineers responsible for deciding upon the site and lay-out have generally been wiser in their choice than those who settle the sites and lay-outs for electricity-generating stations. Gas-works almost invariably have a railway siding, with plenty of water available. Even if there is not a siding, the works are situated near a railway, from which a siding can be brought as and when the business warrants the expense. I have investigated many of these sites, and it is no uncommon thing to find the best position in the town obtained for the gas-works, and the worst for the electricity works. The latter usually has no siding, no natural water supply, and often is situated in a residential district. This is the case where large stations have been established during comparatively recent years. As the first step in the cheap production of light, heat, and power, the site is of primary importance.

We now come to an important point, which has surely been overlooked. This is, the generation of electricity at a gas-works permits of the use of coke as fuel, and at a minimum of transportation cost. From the national and every other point of view, it can hardly be questioned to-day that avoiding burning raw coal for any purpose whatever is eminently desirable. Government committees, and all kinds of other committees, have reported in favour of the recovery of bye-products from coal, and very strongly against its use in a raw state. Of all the industries using coal, the gas industry, for all practical purposes, is the only one that treats it in the manner recommended by these committees; yet we find the Government responsible for encouraging actively the installation of huge stations where raw coal is to be burnt for the production of electricity. At the same time, it must be borne in mind that there are coals so poor in yield of bye-products that they are only suitable for use direct, without any attempt at bye-product recovery. The inferiority of most American and German coals (from the carbonizing point of view) probably accounts for the existence of huge coal-burning electric stations in those countries; and this practice we in this country, though possessing better coal, are advised slavishly to follow. Such coals, however, are comparatively rare in this country, compared with the many that should be subjected to carbonization before use. It spoils one's case to take extreme views on any subject, and the burning of raw coal in large power stations has got to a stage where it is impossible to stop it; but I do say most emphatically that there should be some authority that has power to say what classes of coal should be used in such stations, and prevent them using coal that is rich from a bye-product recovery point of view. It is gratifying to note the growing practice (largely attributable to the energies of Mr. E. W. L. Nicol, of the London Coke Committee) of sandwiching coal and coke as a boiler fuel. It is an important step in the direction of reducing coal consumption.

It was interesting to those concerned in coal conservation to note the attempt made recently in London for something to be done on co-operative lines. To their credit, the Directors of some of the London Electric Supply Companies and of the Gas Light and Coke Company put forward to the Government a proposal to supply a portion of the electricity required for London from works situated at Beckton. The advantages of this arrangement seem to be irresistible. There are ample existing facilities for dealing with seaborne coal direct from collieries. There is plenty of space and ample water supply, and also, what is most important, a distinct inclination for the gas and electricity people to work together in the common interests. The fuel used for the production of electric power would, of course, have been coke, and the destruction of raw coal for this purpose would have been avoided. It is impossible that this scheme should have failed to produce electrical energy more cheaply than the new super-station which has been approved by the Government lower down the Thames, and which will consume enormous quantities of raw coal.

My partner, Col. Woodall, in a paper before the Southern Association of Gas Engineers, read on November 20, 1919, made a very significant reference to this subject; and as may be naturally supposed, I am in entire agreement with his remarks. One that stands out is: "The bye-products of our gas-works are more than ample to keep the ordinary town electricity generating station provided." And farther on he says: "Both industries are indispensable services to the public, each fulfilling a definite place in the life of the Nation. The public derive no benefit from our opposition (gas and electricity), and would derive very material benefits from our mutual co-operation. Anything that can be done so as to bring these two important industries together must materially assist in the vastly important problem of to-day—the conservation of the fuel of the Nation."

I see that the export of gas-works coke is again largely on the increase. Surely it would be better to use coke for internal purposes, and export coal, than to burn the coal and export coke.

I believe I was one of the first electric supply engineers—it does not matter in the least if I was not—to fit suitable automatic stokers to large power station boilers for the express purpose of burning coke breeze, which we did at Marylebone during the war. For months our power station engineers and the makers of the stokers struggled with the problem. At one time the boiler-house was unbearable owing to the sulphur fumes; then the men had to be supplied with motor goggles to keep the coke dust out of their eyes, because sores began to develop under the eyelids. Then sometimes the fires suddenly went completely out; but by sheer persistence (which has always been characteristic of British engineers), the engineers on this job mastered all difficulties, and successfully burnt neat coke breeze. This gave the same boiler evaporation as the coal previously used, and boiler-house conditions became bearable and normal.

By the way, that is a useful example of the effect of enthusiastically trying-out a new thing. In ninety-nine cases out of a hundred where a man says "he can't do it," it is because he does not want the trouble.

My proposal to combine gas and electricity stations can easily be damned by the engineer, gas or electrical, who does not like the idea; but the indications are that in a few months' time there will be several examples working, and, after all, example is better than precept.

The result of the Marylebone experiment was a very material reduction in the cost of generating electrical energy, apart from the conservation of coal effected. In my opinion, the proposed electricity station at Beckton, burning coke instead of coal, and being able to obtain other facilities by reason of its situation, would have been a better engineering proposition than the Government-blessed Barking station. Why the Beckton scheme

was turned down it is hard to understand; it had the elements of a combination that would have had a most far-reaching effect.

We have found in some of the cases where we are advising on the possibility of combining the generation of gas and electricity, that, in addition to the site of the gas-works being eminently suitable, there are existing buildings that can readily be adapted for a generating station; and the more one looks into the whole thing from the practical point of view, the more apparent become the savings to be effected. In the cases referred to, the electrical supply will not be larger than can be economically handled by coke gas producers and gas-engines driving electric generators; but the limits of this method are, of course, well known, and above a certain capacity coke-fired boilers and steam plant have to be installed.

I recently read an interesting lecture by Mr. Bostock on the subject of "Town's Gas and Producer Gas," and the respective costs of each. He expressed the opinion, based on experience, that the cost of producer gas per therm was about one-half that of town's gas. I did not intend to go into details in this address, but it may be interesting to mention that in one or two of these combined works, where conditions are suitable, we are contemplating the use of blue water gas direct in the gas-engines driving the electric generators. In spite of what various people say as to the objectionably high hydrogen content, we are satisfied that there are no difficulties in running gas-engines from this gas. That opens-up a further point which should interest gas engineers—that is, the possibility of supplying conveniently-situated consumers with blue water gas, probably under pressure, for industrial power and heating purposes. In one particular case, the waterworks gas-engines are easily reached by a main of this kind; and it is intended to drive these, and also those for the electric generators, by water gas. Obviously, water gas costs considerably less than coal gas—otherwise such plants would not be installed; and it seems to open-up the prospect of a low-grade gas being supplied by gas-works for purely industrial purposes. When one views the increasing tendency to supply town's gas of a calorific value as low as 400 B.Th.U., it appears that there will be a very small (if any) margin in the near future between gas supplied for domestic or industrial purposes.

I have already referred to the fact that it is desirable, in the best interests of combination, for the power works to be entirely neutral as regards the respective merits of gas and electricity. To bring this about will probably be a difficult problem. Under municipal control it should be fairly easy. Even under company management there seems no reason why the gas company and the electricity company operating in a small town (which is too small to support both), cutting prices, and each doing little or no good from a dividend point of view, should not combine together and pool their resources, which most undoubtedly would be to the benefit of themselves and their consumers, particularly when operating economies apart from fuel are appreciated. It is generally realized now that competition which takes the form of cutting of prices, though it may benefit the consumer for a time, eventually increases the cost of the commodity to him. The function of the engineer is to make the best possible use of what is available, and when that has become out-of-date and impossible of economical operation, then, and only then, to supersede it by new methods.

I am convinced we have not yet made the best use of our available material, so far as the production of electricity is concerned, largely due to the absence of co-operation between gas and electrical engineers; and, furthermore, I do not believe that huge stations and undertakings, whether for gas, water, or electricity, have any advantage whatever over those of medium size. What seems to be required is stations of such a size as will supply the entire light, power, and heat requirements of the districts in which they are situated, and which are so arranged as to effect the greatest possible economies in fuel, plant, and labour. I am by no means the only electrical engineer who disbelieves in the economic superiority of the electrical super-station as it is being designed to-day, and I believe that co-operation between the gas and electrical interests would do much in the direction of a more sane, if less imposing, policy. The public is so gullible; it firmly believes that anything colossal must be economical.

We have now Electricity Commissioners—a Government department engaged in developing electricity supply. There should be a Gas Commission on similar lines, then amalgamation of the two as a Light, Heat, and Power Commission. If by that time the British coalfields still hold out, we, or rather our successors, will have the benefit of an effective Fuel Conservancy Board.

DISCUSSION.

The CHAIRMAN (Mr. D. C. Cross, Lea Bridge) said they had had a type of address with which the Association were not often favoured. That was to say, an address on policy rather than on detail. They should feel honoured that an engineer of such high repute should have come down and talked to them upon what was really a national policy. The case which Mr. Seabrook had put before them was undeniably a very attractive one; and he had presented it in an extremely clear and broad-minded manner, which was just what one would have expected from an engineer of so wide an experience. The idea that the electricity undertaking and the gas undertaking should take a neutral stand was ideal; but there was prejudice and conservatism to be overcome. Those who had read in the Technical Press the accounts of a recent debate at Chelmsford, must have remarked that there was not much spirit of co-operation there, nor any great evidence of a neutral attitude. It would be a long time before all-round co-operation could be secured. Mr. Seabrook said there should be some authority with power to prevent the burning of raw coal. Only the Government could be this authority; and at the present time they seemed to be biassed in favour of electricity. There appeared to be a lot of wire-pulling going on behind the scenes; and he was afraid gas was not being given its fair chance. If only a few engineers like Mr. Seabrook would keep on pushing at this matter, the co-operation they desired might be brought about. There was one particular point in this connection which appealed to every engineer—the amount of money that was spent in the transport of raw material. If the gas and electricity works were adjacent, enormous sums of money could be saved in this way alone. It was gratifying to hear of the success that had been achieved at Marylebone with the automatic stokers for burning coke breeze, so that neat coke breeze gave the same boiler evaporation as the coal previously used. If such a result could be secured, it showed that with closer co-operation between gas and electricity energy could be generated much more cheaply, besides the great saving there would be of national fuel. As to schemes for erecting huge electricity generating stations, he believed that they would not tend to the increased efficiency that some people claimed. It was Mr. Seabrook's wish that the address should be open for discussion; and as there were some distinguished visitors present, they would like to have some remarks from them. Mr. Edwards was running a combination of gas and electricity at Aldershot; and perhaps he would say a few words.

Mr. R. W. EDWARDS (Chairman and Managing Director of the Aldershot Gas, Water, and District Lighting Company) said that really the address was a reflection upon the gas industry, because the latter was twenty-five years behind its time. The industry had been giving attention to this subject during recent years; but they really ought to have thought about it when electricity first loomed upon the horizon. He could speak with some experience of the gas industry, because he was within a day of completing 38 years' service with it. In this time, he had seen the industry pass through a good many stages; but even from the very commencement of the coming of electricity, he had felt that here was something which should be taken up by someone else already established. All along it had seemed to him that, instead of electricity being allowed to be operated as a separate undertaking, it ought to be done inside the gas-works, where there was always the possibility of economically using their prime product, gas, in the internal-combustion engine. To-day the gas industry must recognize that it had a very serious competitor; and looking back on these past years, it must be admitted that a splendid opportunity had been lost. Not so very long ago, a well-known Metropolitan gas engineer had said to him: "We have let this electrical business pass away; and now it is too late." Well, it might be too late in London, but it was not too late in many other parts of the country. Referring to his own experience, he could say that, in running a gas undertaking in conjunction with a water undertaking and with an electrical undertaking, there were innumerable ways in which economies could be effected. In his case, they pumped a large quantity of the water by means of gas-engines; and the electricity also was generated by gas-engines. So far as he could say at the moment, he did not think there would be any change from this policy. His present feeling was to develop the use of his gas, because the bigger the output the more economically it could be produced, and the more cheaply it could be sold. He did not think there was any possible doubt about the advantages that could be reaped by the combination of gas and electricity. With the view that too much had been made of the electrical super-stations, he was in hearty agreement. He believed that the smaller stations were much better, especially when run in conjunction with gas-engines. Here one could put down smaller units, which responded more quickly to an increase of load; and there was a large saving of capital in installation. It was a subject upon which he could talk for a week, because he was fully in accord with the policy Mr. Seabrook had so ably set out in his address. His (the speaker's) only regret was that the address had not come from a gas engineer—much as he was obliged to the author—because he felt that Mr. Seabrook had reminded them of their own omission, an omission which ought to have been rectified many years ago.

The CHAIRMAN then called on another esteemed visitor, Mr. Fisher, of Tottenham, who had something to do with the running of gas and electricity on the works there.

Mr. JOSEPH FISHER (Tottenham District Light, Heat, and Power Company) said he had really come to the meeting as the representative of Mr. A. E. Broadberry (the Chief Engineer and General Manager of the Company), who was unfortunately kept away by a previous engagement, or would otherwise have been present to hear the address and offer some remarks upon it. In Mr. Broadberry's absence, the members might be interested in some criticisms and remarks from him (Mr. Fisher), as it was part of his work to look after the electricity department of the Company. There was, he thought, only one Company in Greater London who were authorized to supply both gas and electricity. The Tottenham District Light, Heat, and Power Company supplied gas to an area of over 30 square miles, with a population of about 500,000. They also supplied electricity in one part of their district, Wood Green, which had a population of 50,000. Mr. Seabrook had given them a very interesting address, which, from its very nature, had to be of a general character. It could not be otherwise, as the circumstances of different localities varied so greatly. They might have a combined gas and electricity works, and might generate with town's gas, blue water gas, or producer gas. It might be better in a combined station to generate with steam plant using coke or coke breeze as fuel, or it might be better to separate the two plants, and have the electricity station near the centre of the district, and generate with gas of some sort. This led him to the only question he wanted to ask—What, in Mr. Seabrook's opinion, was the largest economical size for a generating station run with gas-engines? They would see his reason for asking this, when he offered a few remarks upon his Company's own station. Mr. Seabrook spoke about the cost of producer gas being half of that of town's gas per therm. He (the speaker) should think it would be less than half; but its varying composition, and liability to tar troubles, together with labour costs, made it a far from desirable fuel for large engines. One must also have more stand-by plant. With regard to the

blue water gas, this was not so very much cheaper, therm for therm, than town's gas. The Tottenham Company possessed parliamentary powers for the supply of power gas for industrial purposes; and when, some years ago, they went into the question of supplying blue water gas for power to factories within half-a-mile of the works, they found—and the manufacturers found, too—that it was not a paying proposition. They preferred the superior town's gas, even at the higher price. As regarded the general proposition put forward in the address, it would be, in his opinion, the best practice in large villages and small provincial towns which were not near a generating station big enough to give a public supply at a cheap rate; but though it worked very well up to a certain point, the time would come when it had to be scrapped, and this for two reasons: (1) The complexity and cost of a number of gas-driven units; and (2) the difficulty of transmission and distribution of direct current. Most of the big electricity concerns started as "D.C." stations, the majority of them with reciprocating steam-engines, and others with gas-engines; but the time came when the direct current went, and single-phase alternating current was introduced. Later came the three-phase current, with steam-turbines. While stations were small, "D.C." with a battery was all right, because the battery took charge of the night load. With large stations and "A.C.," linking-up got over the night difficulty, as one or two machines could supply current during the night for a very large area. In the generating station at Wood Green—which was, he might say, in a residential district 3 miles from the works—there was a gas-engine plant of 700 KW. nominal capacity, working on town's gas. By constant attention they had, during their seven years' life, never had a failure of the current during lighting hours; but he must say that he did not relish the idea of such an important shopping district as Wood Green being dependent upon gas-engines for its supply during the busy dark evenings of December. With engines running at 85 p.ct. of full load, a single hot piston, or a single valve-spring breaking, might easily put the place in darkness; and though it was usually assumed that a gas-engine could be started-up and got to work in a very short time, they found in practice that it took at least twenty minutes to start an engine and run it up to full load with safety. He gave these details as an instance of a gas-driven station getting too large for it to continue on its original lines.

The CHAIRMAN then called for a few words from Mr. E. W. L. Nicol, as an authority on boiler firing.

Mr. E. W. L. NICOL (Engineer and Fuel Expert to the London Coke Committee) recalled his first interview with Mr. Seabrook, early in 1917, when he suggested to him that he should use coke instead of coal for the power station at Marylebone. Very shortly after this Mr. Seabrook placed an order for coke-burning mechanical stokers; and he believed he was the first electrical engineer in London, if not in the country, to do this. He (the speaker) found that the amount of coke consumed at the Marylebone power station, and drawn from one gas company alone in London, was something of the order of 50,000 tons. The system was still in use; but he had heard there had been a tendency, since Mr. Seabrook left, to follow false gods. They were flirting with oil, and seemed at the moment undecided whether to extend the coke-burning plant or to adopt oil. It was certainly his opinion that very great economies could be secured by the closer association of gas and electricity supply. There were several directions to which Mr. Seabrook had not alluded in which economies could be effected; but, of course, he had made no effort to go into details. On this question, he (Mr. Nicol) had recently submitted, on behalf of the National Gas Council, evidence to the Electricity Commissioners. In this evidence he pointed out that the sensible heat available on a gas-works was very considerable; and that if the electricity works were adjacent to the gas-works, this sensible heat could be very largely used. In the hot coke alone at one large London gas-works he calculated that, on a 10 p.ct. efficiency basis of conversion, the sensible heat available was equivalent to something like 12,000 H.P. going to waste 24 hours a day, and seven days a week. This was one item alone of waste heat. The other waste heat available, of course, was in the flue gases; and this would be useful for feed heating. Another aspect of the question was the possible development of the gas-turbine. One result of building the power station adjacent to the gas-works would be that, in the event of the development of the gas-turbine, the surplus coke could be converted into low-grade gas, which could be supplied to large turbines. But to build the power station even a short distance away from the gas-works—say, the distance between Barking and Beckton—was sufficient to rule this possibility entirely out. He thought that Mr. Seabrook was deserving of support, when deploring the decision of the Government to sanction the building of a power station at Barking instead of at Beckton. Mr. Seabrook very kindly identified him (Mr. Nicol) with the "Sandwich" system of fuel blending; and he was the first electrical engineer who had done this. He (the speaker) held the patent rights for the system, which had been very largely adopted at power stations; and these "Sandwich" fired power stations were, with few exceptions, the most economical throughout the country as regarded fuel cost per unit generated. Among other places, there was Darlington. For some time it was claimed that their fuel cost per unit generated was the lowest in the country; and, so far as he knew, they still held this position. It was very gratifying to him to think that this had been accomplished by the use of the "Sandwich" system. There was yet another aspect of closer co-operation between gas and electricity that he had had occasion to look into, and that was the possibility of supplying to the electricity works steam at a constant high pressure and a constant temperature. It would be quite a feasible proposition to have a steam-generating plant put down on a gas-works, and for the gas undertaking to supply high-pressure steam. The boilers could be fired with incandescent coke; and thus the sensible heat now lost through quenching could be fully utilized. This would save a double loss, because there was first the loss of sensible heat in quenching the coke, and then the heat required to raise it again to ignition temperature.

The CHAIRMAN then called upon Mr. Stewart, who, he said, had been turning this subject over in his mind for years.

Mr. E. G. STEWART (Fulham) said that with much of Mr. Seabrook's address he was in hearty agreement; but, like Oliver Twist, he wanted more. Just at the moment when the address began to be really interesting, it stopped. What he would like to know was how Mr. Seabrook proposed to do some of these things. It was quite easy to see it was very desirable that, in the case of new communities, gas and electricity undertakings should be amalgamated into one; but at the present moment the majority of communities in the country were already established. Therefore the great bulk of this business necessarily merged into the co-operation of existing gas and electricity undertakings, which did not appear to him quite so easy. Mr. Seabrook's address divided itself under three main headings. The first thing was that it was eminently desirable that the whole of the coal which was carbonized, or carbonizable in power stations, should be carbonized before combustion. The second one was the substitution of the products of coal which was at present carbonized for raw coal in power stations; and the third was the utilization of gas bye-product fuels which were at present exported. So far as the last point was concerned, he thought there was no doubt that, as long as the fuel was exported at a price less than it would fetch in this country, it was desirable that it should be transferred to the power stations. The next thing was the utilization of the present make of coke and breeze, apart from that which was exported. From the point of view of fuel conservation, he would like to know how this was going to affect the matter. Supposing they substituted for the whole of the coal burned now in power stations coke which would otherwise not have been exported, unless very great saving could be effected in the cost of gas or electricity, the man who at present used coke fuel would simply go back to raw coal; and he would probably burn it less efficiently than was done at the power station. This was from the point of view of fuel conservation only. The other point—the carbonization of coal previous to combustion at power stations—it seemed to him would entail the enlargement of the existing gas-works (together with fuel transport), or the erection of new gas-works at every power station; and it would also entail, so far as he could see, the production of a certain amount of gas which would have to be burned, because the load would not increase. Therefore it meant that every electric power station would have to have a proportion of gas plant and a proportion of steam plant. On what lines did Mr. Seabrook think this could be carried out? He (the speaker) did not believe the amount of coke exported at the present time would be sufficient to replace the coal which the power stations of the country consumed.

Mr. A. BROADBENT (Gas Light and Coke Company) said it had already been remarked that engineers in this country were very loth to change their methods. They should take a leaf out of the Americans' book; for he could say that twenty years ago there was a good deal of co-operation over there between gas companies and electrical undertakings. So much so that there were frequent amalgamations; and in new communities electricity stations and gas-works had been run by one company, and there was no competition. He had listened with great interest to Mr. Seabrook's policy, which he hoped would have far-reaching effects.

The CHAIRMAN remarked that they had with them a highly-esteemed member of the gas profession, from whom they would like to hear something. He referred to Lieut.-Col. Woodall, who was well known to them, and was in partnership with Mr. Seabrook.

Lieut.-Col. H. W. WOODALL said that more years ago than he liked to think of, he left the electrical industry because he thought there was a very much bigger future before the gas industry. They had been told that the Tottenham Gas Company had never let their consumers down. Well, he could assure them that on one evening when he was in charge of the City of London Electric Light Company, he had the whole of the lights in the City out three times, which was something of a record. He had only lately discovered that, when he walked out of the electrical industry, the gentleman who walked in and took the place he had vacated was Mr. Seabrook. He thought it spoke well for the strength and vitality of the gas industry, that electrical engineers, even so late in the day, were beginning to appreciate that it was a live and valuable industry, and was doing such good work. If they had only had Mr. Edwards to advise them many years ago, those present that night might have been very much bigger people, because they might have been in charge of much larger undertakings; but this was no reason why they should not now take their opportunities, even though they might be very much smaller. There were numbers of small gas undertakings in this country who were still the only purveyors of fuel, apart from solid fuel, in their town; and they still had the opportunity of generating electricity for themselves. It had been a great surprise to him, on going into the matter recently, to find what a very large number of towns there were which still had no electricity supply whatever; and he thought it was for those of them who knew so well what ought to be done to do the best they could to see that it was done. It was for brains—for knowing how to do things—that money should be paid; and it was the people who knew how to carbonize coal that should be carbonizing coal for the good of the country. As he had already said, many years ago he left the electrical industry to go into the gas industry, because he thought there was more opening in the gas industry. He had never for one moment regretted having done this; but he had sometimes thought that they in the gas industry were not as alive to their opportunities as others. It was for the members of the Junior Associations to take this thing up. Whether it was electricity or whether it was anything else, it was the younger members who should be pushing their good old industry forward the whole time. It was upon them that so much depended. If the younger members were really keen upon these things, they would be accomplished. He was confident of this. If anybody who wished to see a thing done only worked hard enough, it would be done. He thanked them very much for the opportunity of participating in one of their enjoyable evenings.

Mr. S. B. CHANDLER (South Suburban Gas Company), representing the distribution side of the industry, remarked that there was one thing he would like to say. Whatever might be the future policy of the gas and electrical industries, whatever combinations might come about, the consumer—and, after all, the consumer was the man who kept them in their jobs—had benefited very materially indeed from the competition which had of late years existed between gas and electricity; while had it not been for the advent of electricity, certainly the gas industry might not have been in the proud position it occupied to-

day. When electricity was first introduced as a commercial proposition, gas shares fell, and the industry was presumed to be moribund. But what happened? After the coming of the carbon filament lamp, came the incandescent mantle; and these were followed by further progress all round. He felt that some day this combination would come about; and if it produced a cheap therm, it would no doubt materially assist the gas industry to increase its output. Mr. Seabrook said that, in his opinion, there should be some authority to prevent large consumers from using coal of good bituminous gas-making quality. This surely should extend to the ordinary domestic consumers, who in the aggregate were serious offenders in that respect.

THE REPLY TO THE DISCUSSION.

Mr. SEABROOK, in his reply to the discussion, said Mr. Chandler had touched upon the weakest spot in the whole thing—that was, the danger of what the Americans called "combination in restraint of trade." Now, in America they had a really rather remarkable method of preventing the public utility corporations, as they termed them, from exploiting the public. He did not know much about gas and water; but he did know what happened in connection with American electricity supply undertakings. There were State Commissions who regulated rates of charge, and ensured that the consumer was not charged more than he ought to be; and this had much the same effect as the sliding-scale in this country. But the extraordinary thing was that these Commissioners not only protected the consumers, but they also protected the shareholders of the company. If the rates were unnecessarily low, the State Commission stepped in, and said: "You are not doing the proper thing for your shareholders." It was rather an extraordinary state of things; but it had happened in a good many cases. If it were possible to get such an enlightened method as that, he should not think there would be much objection to this sort of thing. If the suggested development was going to make headway—and many people besides himself thought it was—there should certainly be some State machinery to prevent unfair treatment of either consumers or proprietors of the concerns. Coming to other points raised in the discussion, the efficiency of the use of coal in gas-works was pretty high at present; but that it could be very much higher there was no doubt. There were, for instance, the thermal units which were lost in quenching coke and in the waste gases. A great deal was already being done in the latter direction. There were very large installations going up, in which the whole of the steam and hot water required in gas-works was raised from waste heat. Some reference had been made to the number of places in the country where there was a gas-works and no electricity supply. This applied largely to the southern parts, where users for power purposes were far between. He did not regard a place of 500 inhabitants as too small; but in such cases there was no reasonable way of giving a supply of electricity except by combination with the gas-works. One had only to look at the balance-sheets of small electricity concerns "running on their own bottoms," to see that they were all financial failures. To supply a thing that did not pay was not business, and could not last; but these small places could get a supply of electricity at a reasonable price, if the electricity works were combined with the existing gas-works, which possessed so many of the features that the electricity works required. Generally the gas-works was the biggest buyer of coal, and was the only place in the town with mechanics, foremen, &c., that was open for 24 hours a day. By adding only a small percentage to the existing costs, one could obtain electricity and gas at the same time. New communities—such as some of the Garden Cities—could, and did, combine gas and electricity; but there were also cases in which combination could be brought about where the two undertakings hitherto had been kept separate. There were, also, still quite large towns of 40,000 inhabitants where there were gas-works and no electricity works; and these were "happy hunting grounds," because one could start on a fairly big scale with combination. He had heard of one big Corporation in the North, who owned at present huge gas-works and electricity works, both of which (in spite of their hugeness) were too small for existing demands, and who had secured a fresh site on which they were contemplating making extensions of both undertakings. Mr. Stewart made a point that if they used all their coke for the production of electricity there would not be enough for domestic users; and, anyhow, there would not be sufficient if all the power stations turned to the use of coke instead of coal. But one knew that in this country there were quite large quantities of coal which were not useful for anything except burning under boilers—they really came under the same category as anthracite—and one had to strike a happy medium. This was why he had been rather anxious to avoid making too drastic suggestions. To have said there should be no coal burned, might have been right; but it would have been an impossible position to adopt. The present view was that coal had to be burned, but that there should be some supervision over the burning of raw coal, and it should not be done haphazard. He had already referred to the most important possible improvement in thermal efficiencies in gas-works. This matter he had discussed with several gas managers; and they had been very much afraid of the effect upon the chimney draught of reducing the temperature of the waste gases from retort-settings. One engineer had pointed out that serious trouble with the make of gas was caused by erratic draught on the stack; and that if boilers were put in these flues to recover the waste heat, it would be pretty certainly necessary to instal fans, so that the draught on the retort-settings could be controlled, and if the gases were cooled too much it could be made up for by running the fan. Reference had been made by Mr. Fisher to the size of station suitable for installing internal-combustion engines. This was a most difficult point to decide. One engineer would say 1000 H.P., another 5000 H.P., and a third 10,000 H.P. He thought the decision must be governed by conditions in each individual place. It had recently come to his notice that the two big British cement companies used nothing but gas-engines. There were rows of them of 500 to 1000 H.P. each; and they were always ordering them. These stations, which generated electricity for the cement works, were of many thousand horse-power capacity. Palmer's Shipbuilding Works also had thousands of horse power in internal-combustion engines driving electricity generating stations. He could not think they would do this if it were not a perfectly sound proposition. It showed the difficulty of laying-down a hard-and-fast rule. Mr. Edwards had touched upon the question of economies to be effected by combination. He (Mr. Seabrook) had seen the Aldershot Company's gas-works and electricity stations, and could appreciate that Mr. Edwards's experience in this respect had been a very happy one. There was no doubt that the gas industry lost a great opportunity 25 or 30 years ago; but it was easy enough to talk when everybody was wise. The Chairman had mentioned one particularly important point—the saving of transport. In the case of the Marylebone mechanical stokers, if the station had been close to the gas-works a very big additional saving would have been effected in respect of transporting the coke breeze. He thought it would be correct to say that in the first contract with the Gas Light and Coke Company, 50 p.ct. of the price was for transport and handling.

UTILIZATION OF BLAST-FURNACE GAS.

Lecturing at Middlesbrough on "The Products of the Blast Furnace," Mr. A. HUTCHINSON, M.A., B.Sc., of the Skinningrove Iron Company, Ltd., said he foresaw a time when the local iron-works would be able to supply most of Cleveland with gas at a considerably cheaper rate than now. The utilization of the waste gases from blast furnaces had been one of the greatest advances in blast-furnace practice during the last thirty years. The uses of these gases had now been put on a much more economical basis.

A further step had been the extraction from the dust which the gases contain of bye-products which it was hoped would prove of value. Until recently, dust was considered wholly objectionable, and the cleaning of the gas for gas-engines more or less of a necessary evil. The necessity of doing this, however, had opened the eyes of engineers to the possible advantages to be obtained from the blast-furnace system by cleaning the whole of the gases. The method of cleansing depended upon filtration by cloth bags; and it had been proved that the efficient working of the stoves and boilers was by this means much increased, and that the products from the dust were of considerable commercial value. This was but another instance of the way in which products from a blast furnace were now reclaimed and turned to profitable use, thus helping to reduce the cost of the manufacture of the main product—pig iron.

Mr. Hutchinson observed, in the subsequent discussion, that some progress had been made in connection with the idea of utilizing blast-furnace gas, or a combination of blast-furnace and coke-oven gas, for heating the coke-ovens, and leaving the larger proportion of the richer coke-oven gas to be used in other parts of the plant. Blast-furnace gas was enriched at Skinningrove by coke-oven gas, there being 75 p.ct. of the one and 25 p.ct. of the other; but unless blast-furnace gas was cleaned, plant would quickly be choked up.

Mr. J. H. Harrison advocated the cleaning of the whole of the gas. This would not only be to the advantage of individual firms, but of benefit to the general public. They all knew what the atmosphere was like during the time the whole of the furnaces of Middlesbrough were shut-down because of the coal stoppage last year. If all the blast-furnace gas were cleaned, the atmosphere would be almost as clear always as during the stoppage. Middlesbrough had the highest death-rate of ninety-six large towns. What was the cause? Certainly there were slums; but he was very strongly of the opinion that the fine dust from the blast-furnace gas was very largely the cause of so much disease in the respiratory organs. By cleaning the gas and making use of it for generating electricity, which would then be produced at a cost less than many consumers were paying for current to-day, they would at the same time be cleansing the atmosphere and reducing the death rate. Processes of cleaning the gas had now been sufficiently proved, and there was no need for uncertainty. More attention should be paid to this matter than had been the case.

Possibilities of Expansion in the Gas Business.

The opinion has been expressed by Mr. Oscar H. Fogg, Secretary-Manager of the American Gas Association, that the idea of substituting gas for a large part of the coal now consumed in the United States is far more than an idle dream. The possibilities for expansion of the gas business are almost beyond understanding. For instance, about 13 p.ct. of all the bituminous coal mined in that country is used for domestic purposes. Therefore if one assumes a normal production of 500,000,000 tons of soft coal annually, about 65,000,000 tons of this coal would be used in homes for heating and cooking. Many of these dwellings are located on farms or in small communities where it would not be possible or profitable to construct a gas plant; but probably one-fourth of the households now consuming coal could substitute gas entirely for the coal used. Thus, if it is calculated that 65,000,000 tons of bituminous coal and 70,000,000 tons of anthracite are burned each year in American homes, and that gas might be legitimately used to supplant coal in one home out of every four, it is seen that gas should do the work performed by 34,000,000 tons of hard and soft coal. Going a step farther, and assuming that 15 000,000 B.Th.U. in the form of gas will be required to displace a ton of coal, and that each cubic foot of gas will contain 500 B.Th.U., it will be seen that the total volume of gas needed to replace this coal will amount to more than three times the volume of manufactured gas sold in the United States last year.

MIDLAND JUNIOR GAS ASSOCIATION.

Visit to the Birmingham University.

A representative gathering of members of the Midland Junior Gas Association paid a visit to the Birmingham University on Saturday last. The necessary permission was granted by the Dean of the Faculty of Science; and a very instructive afternoon was spent in inspecting the various sections.

The party were conducted round the Metallurgical and Electrical Engineering Departments, which are well equipped and really up-to-date. The Mining Section was then visited, and much interest was exhibited; the laboratories including a mineral dressing laboratory, with crushing, sizing, and dressing machines capable of treating experimentally any ore or fuel. The model of a lead mine attracted considerable attention.

The Strength of Materials and Hydraulics Laboratories in the Civil Engineering Department were then inspected; a feature of note being a 300-ton tensile testing-machine installed by Messrs. W. & T. Avery, Ltd.

In the Power Station, a variety of engines was seen; and it was interesting to learn that the whole of the electricity for the University was generated at this station. The plant had run continuously during the war period. A Diesel engine from a German submarine, handed over to the University by the Admiralty authorities, was of especial interest. An ammonia refrigerating plant, driven by an 8-H.P. engine, was also on view in this section.

The Mond gas and boiler plants were next inspected, which terminated an interesting visit, for which the best thanks were extended to the authorities for granting the necessary permission.

SCOTTISH JUNIOR GAS ASSOCIATION.

(EASTERN DISTRICT.)

Visit to the Works of Messrs. R. Laidlaw & Son.

Some forty members of the Scottish Junior Gas Association (Eastern District) visited the works of Messrs. R. Laidlaw & Son, Ltd., Edinburgh, on Saturday, Jan. 21. They were received by Colonel Laidlaw, Mr. Brown, and other members of the technical staff.

It was explained that the works of the firm were probably the oldest engaged in the manufacture of gas appliances, having been originally erected on the present site before the beginning of the nineteenth century. Then the house of Laidlaw was engaged in the manufacture of general brasswork; but from the birth of the gas industry, it had energetically interested itself in the manufacture of gas-meters and other gas appliances. In those early days European countries were entirely dependent on British manufacturers for their gas appliances; and Messrs. Laidlaw received a goodly share of this trade.

The various parties, accompanied by efficient guides, commenced their tour of the works at the brass-fitting warehouse, passed first of all through the general stores, where all parts and fittings in connection with meter manufacture are kept in stock, ready for issue to the tinsmiths for assembling. The engineering workshops were then visited; and here machines were in operation producing heavy stampings for meter cases. On a table in the shop had been laid out the whole of the parts used in the construction of a 5-light dry gas-meter; and this gave the visitors an opportunity for forming an idea of the multiplicity of parts which comprise one. A feature of great interest was the manufacture of the Siemen's water-meter, and the testing of the meter by tank measurement. The turbine principle on which this meter works, was, by the aid of a sectional model, clearly explained by the guides. The tinsmiths' department was next visited, where the party saw the various processes of assembling the meters. The brass foundry, brass-finishing shops, index and prepayment departments were visited; and the various machines and processes seen in operation.

In the testing and proving shops, the operation of testing the meters was seen in progress; and a demonstration, showing the capability of the new standard meters, was given. A very gratifying feature from the gas point of view was that the whole power for the works is generated from town's gas by "National" gas-engine sets, and the guide was eloquent in praise of this form of power. Members were much impressed by the efficiency observed on every hand. In the evening, the visitors were entertained to tea at Messrs. Ferguson and Forrester's.

After tea, Colonel LAIDLAW, addressing the members, said it gave him great pleasure to take the chair on this occasion; but he regretted very much that the Manager (Mr. Young) was prevented by illness from so doing. Mr. Young and their draughtsman were the only two members of their staff who were not present that evening. Certain portions of the works they had seen that afternoon were 150 years old; but in the course of time great changes had taken place. In 1876 the works were burnt down, but were afterwards rebuilt, and since had been added to considerably. Their aim had always been to keep up to times. When he was a boy, all operations in connection with meter manufacture were done by hand. But now, as the members had seen that afternoon, handwork had very largely been superseded by machinery; and meter making was now a question of accurate fitting and soldering. In his opinion, for some reasons it was a great pity that the delicate handwork of olden times had almost entirely been displaced by machine work, though it was a fact that a machine-made gas-meter was a far better job. The second steam-engine in Edinburgh was put into operation in their works. But his grandfather was not a sentimentalist; and after he scrapped it, the metal was probably melted down, for there was no trace of the engine now. He regretted this, for he would have preferred its preservation as a relic. This steam-engine was replaced by other steam sets; and these in turn were replaced by gas-engines. The gas-engines worked on town's gas, and never gave them a moment's worry. The running costs were very low; and they found this form of power very satisfactory. Their great endeavour at all times was to turn out a good article. They had sent things to the ends of the earth; and in darkest Russia, he was sure the name of Laidlaw could be found. The firm were delighted to have the privilege of entertaining the members of the Scottish Junior Gas Association that afternoon.

Mr. M'DONALD, in reply, as President of the Association desired to express the thanks of all for the enjoyable and profitable visit that day. It was an education to see the care exercised in the manufacture of a Laidlaw meter. Most of the members were acquainted with the finished article—much better than with the details of its manufacture; but they had all had a thorough lesson in meter making that afternoon. He was greatly surprised to see that Messrs. Laidlaw made paraffin oil burners; but he had been assured they were not for use in Edinburgh. He requested the members to accord the firm, coupled with the name of Colonel Laidlaw, a very hearty vote of thanks.

To this the members heartily responded.

A very pleasant evening followed, to which members freely contributed with musical and elocutionary items.

SULPHATE OF AMMONIA IN FRANCE.

The French Sulphate of Ammonia Federation has just published a Year Book for 1922, which has been compiled in collaboration with the majority of agricultural combines and users of manures. The 260 pages of the book include a map of France showing the division of the Departments among the Federation's sub-offices. There are also printed below the map results which show the excellent effect of sulphate on the more important crops; and inside are articles of general interest regarding its use. The book is on sale for frs. 2 at the headquarters of the Federation, No. 57, Rue de la Chaussée d'Antin, Paris, IXe.

A recent number of the "Journal des Usines à Gaz" reproduced some interesting information as to the use of sulphate on vines. It seems that up to the eighteenth century it was generally held that manure of any description impaired the quality of the wine; and it is recorded that in 1748 the Governor of the Province of Languedoc forbade it by statute. This opinion is nowadays largely reversed. The Federation's sub-office at Montpelier specializes in propaganda for the use of sulphate on vines, and has already effected an increased consumption in the rich vineyards on the Mediterranean slopes; while in every wine-growing district its use is spreading. The vine is particularly greedy for nitrogen, as the following nitrogen contents in the finished product in grammes per litre (prepared by M. Müntz, Member of the Academy of Science) will show: Red wine of the "Midi," 0·278; Burgundy, 0·768; Médoc, 0·381; St. Emilion, 0·435.

In most viticultural centres exist experimental grounds, which are divided into three allotments as similar as possible. Two are treated with different manures; the third is left untreated. Experiments carried out in two vineyards where the variety of the vine and the soil were different, at Alvent in the Dordogne valley, produced the following results:

A.—Light sandy top soil. Gravel sub-soil. "Merlot" plants, 3200 to the hectare. Sulphate spread in circle round the bared roots, which were immediately filled-in:

Sulphate, per hectare	235 kg.
Grape yield, ,,	8170 ,,
Without sulphate, yield per hectare	6830 ,,

B.—Heavy clay top soil. Rocky sub-soil. "Malbec" plants, 3200 to the hectare. Sulphate distributed as before:

Sulphate, per hectare	235 kg.
Grape yield ,,	8702 ,,
Without sulphate, yield per hectare	7232 ,,

Hundreds of cases can be cited to show that in every wine district the employment of sulphate has tended to more regular development, more perfect maturity, and a fuller harvest. It strengthens the vines against diseases and frost, and last but not least is responsible for a marked improvement in the quality of the wine. Its convenience of working is well known.

Sir John Cass Technical Institute.—Prof. William Rothenstein M.A., Principal of the Royal College of Art, will distribute, on Wednesday of next week, the prizes and certificates gained by the students during the past session. On the same occasion he will deliver an address on "Education and Industry."

Alcohol from Water Gas.—Mr. G. C. Calvert, in a letter to the "Chemical Trade Journal," referring to the recent Fuel Research Board report on alcohol, states that scale-model plants at work at the Metropolitan Laboratories, Twickenham Park, are making ethyl alcohol from water-gas mixtures at the rate of 1 gallon of ethyl alcohol per 1000 c.ft. of gas, and that there is every indication that this efficiency will be greatly increased on larger-scale plants. The process is extremely simple, and works consistently under all conditions likely to be met with in practice.

THE DETERMINATION OF WATER IN TAR.

In a recent number of "Das Gas- und Wasserfach," Dr. Kisskalt, of Nürnberg, wrote of his experience in tar testing for an important German firm, where much of this work had to be done. The following is an abstract translation of the article.

The author refers in the first place to the importance of his subject, in view of the high prices now paid for tar in Germany, and the sometimes large quantities of water in the tar offered for sale. He himself has had tests up to 50 p.ct.

In view of the fact that samples are generally taken at the gas-works as well as by the buyer on delivery, and that the two samples frequently differ by as much as 5 to 10 p.ct., the author emphasizes the advantage of an agreed method of sampling. For the sender, he considers the best way to be by siphoning out of the wagon when ready loaded for the journey. But for the receiver, this is not always so simple; for very often, during the long railway journey, a layer of water has separated out, and lies on top of the tar in the tank. In many wagons, siphoning gives too high a percentage of water; and, if the tar is at all thick, it is impossible to stir it to a mixture that will give a fair sample. German customs officials are given instructions, in case there is free water standing on top of the tar, or at the bottom of the tank, to measure the quantity of water, and derive the weight, making allowance for it in their calculations. This again may present some difficulty in the case of tank-wagons with curved tops, when the contents are filled up to the curved portion. In such case it is suggested there is no other way but to take the exact measurements of the outside of the tank, make a sketch to scale, and, having marked in the water-line, to reckon the quantity of water at trapezoid multiplied by length.

Sampling from tar in barrels presents the greatest difficulty, as the barrels generally have only one bung-hole, which is situated in the curved side. Owing to the shape, a separate accurate estimate of the free water is impossible; and a siphon sample almost invariably gives too high a percentage of water. The author suggests that tar barrels should always be provided with a second bung-hole, in one of the flat ends, for sampling purposes only, and that the full barrels should be left standing on end for some time before a sample is taken. Apart from this, he advises mixing several separate siphon samples in a weighed vessel, weighing them, passing off the free water, weighing again, and reckoning the difference as the quantity of separated water in the barrels. But this does not give accurate results—always putting the water at too high a percentage.

For the purpose of measuring the layer of free water in tank wagons, the use is recommended of glass tubes of about ½-in. dia. and 18 in. long. These are dipped slowly into the tank to a depth of 3 or 4 in. below the water-level, closed, and the sample withdrawn. The depth of the water standing on the tar can then be accurately measured. It is suggested that the average of several dips should be taken, and a clean tube used for each.

For taking the samples of tar from beneath the free water, the author has used a tin-plate tube of about 2 in. diameter, fitted at the bottom with a water-tight cuneiform stopper, which is worked by a thin iron rod passing through the whole length of the tube. This apparatus, closed, is passed through the free water, opened, and then slowly pushed down vertically through the whole depth of tar. At the bottom of the tank, it is closed again, withdrawn, and any tar or water clinging to it externally is carefully removed. Several samples taken in this way are well mixed, and two or three lots of 2 litres (3½ pints) taken—one for immediate testing, and the rest to be kept for subsequent reference.

For the actual tests, the xylol method is used, and the results agree on the average to within 0·2 p.ct. The objection of expense is ruled out by recovering the xylol, and using it over and over again. The most convenient quantities in use have been found to be a one-litre (1·8 pints) copper flask for distilling, with about 100 grammes of tar weighed-in, and 75 c.c. of xylol, distilling up to 180° C.

In explanation of the calculation, the author takes as an example a wagon containing 10,000 kg. of tar [1 kilogramme = about 2·2 lbs.]. On the tar is water to a depth of 5 cm., and the wagon is rectangular, 6 metres long by 2·5 metres wide. The tar itself is found by test to contain 20 p.ct. of water. Then—

1. Volume of free water = 2·5 × 6·0 × 0·05 cub.m., weighing 750 kg.
2. Remaining tar weighs 10,000 − 750 kg. = 9250 kg.,
   20 p.ct. of which = 1850 ,,

Total water in the wagon . . . . . 2600 ,,

or 26 p.ct.

Now if, according to the contract, 5 p.ct. of water is allowed in the tar, it is not correct to say that 26 − 5 = 21 p.ct. of water can be deducted, and that therefore 10,000 − 2100 = 7900 kg. of tar have to be paid for. According to the contract, the tar delivered must not contain more than 5 p.ct. of water. The correct method of reckoning is from the fact that in the wagon there are 2600 kg. of water and 7400 kg. of water-free tar. We must, therefore, find the equivalent weight of tar containing 5 p.ct. of water to these 7400 kg. of water-free tar, thus:

95 : 100 = 7400 : ×

so that × = 7789·5 kg., which is the weight to be paid for.

USING-UP COMBUSTIBLE REMNANTS IN CLINKER.

At the end of a long article in "Das Gas- und Wasserfach" for Jan. 7, on the importance, and various methods, of recovering fuel from clinker, Prof. Dr. Karl Bunte, of Karlsruhe, gives some interesting results from a new process, invented by the Stettiner Schamottefabrik vorm. Didier. The regenerative blast-oven, as the plant is called, introduces a new principle, and promises excellent results from the use of all kinds of low-grade fuel. It may sound astonishing, but the system is such that fuel which is abnormally high in ash—60 p.ct. or more—gives the best results, since the ash itself plays an important part in the working. Owing to impending patent rights, Dr. Bunte is not at liberty to give technical details of the working of the system. He can only say (what is implied by the name—regenerative blast-oven) that among other things the plant uses the heat of the clinker for pre-heating the combustion air. It is clear that this should give greater combustion efficiency; but it is only a part of the entire scheme.

The clinker to be used is broken or screened to about half-an-inch, and, in the process, is subjected to air-blasting at 700 to 1000 mm. [27 to 39 in.] pressure. In this way the plant can be used either for primary heating, in which case the combustion gases contain 15 to 18 p.ct. of carbon dioxide and attain a temperature of 1000° to 1200° C. or more, or, by raising the fuel, as a producer, in which case producer gas with 7 to 10 p.ct. of carbon dioxide can be made. At fixed periods, the burnt-out and partly molten clinker, after cooling, is separated-out and removed by a device already known in connection with other apparatus by the same firm.

The author gives some results obtained from the experimental plant, which, he says, have already led to orders being given by several experienced and critical firms.

Combustion Results.

Example I.

Regenerative blast oven used for primary heating.
Material used: Producer clinker, 26 p.ct. combustible.
74 ,, ash.

Size				
0 to 5 mm.	[0 to 0·2 in.]	— 47 p.ct.	} 87 p.ct. below 0·6 in.	
5 to 15 ,,	[0·2 to 0·6 in.]	— 40 ,,		
15 to 30 ,,	[0·6 to 1·2 in.]	— 13 ,,		

Firing 3 tons per sq.m. per hour [about 3 tons per 10·8 sq.ft.].
Clinkering every 80 minutes.

The percentage by volume of CO_2 in the combustion gas is given at 24 intervals during the 80 minutes run. After 8 minutes it is 17·8; after 74 minutes 18·0; while the lowest is 17·2 after 53 minutes, and the highest 20·2 after 30 minutes. Only three times is it below 18 p.ct.

Example II.

Material used: Boiler-house clinker, 21·9 p.ct. combustible.
78·1 ,, ash.

Size				
0 to 5 mm.	[0 to 0·2 in.]	— 44·8 p.ct.	} 93·3 p.ct. below 0·6 in.	
5 to 15 ,,	[0·2 to 0·6 in.]	— 48·5 ,,		
15 to 30 ,,	[0·6 to 1·2 in.]	— 6·7 ,,		

Clinkering every 25 minutes.

In this case the percentage of CO_2 varies between the lowest, 14·8 after 3 minutes, and the highest, 19·0 after 11 minutes. Only three times in the run is it below 18 p.ct. The heat in the combustion chamber is given at 1200° to 1290° C.

Producer Gas Results.

Example I.

Material used: Locomotive clinker, 44·5 p.ct. combustible.
55·5 ,, ash.

Size				
0 to 5 mm.	[0 to 0·2 in.]	— 21·6 p.ct.	} 86·3 p.ct. below 0·6 in.	
5 to 15 ,,	[0·2 to 0·6 in.]	— 64·7 ,,		
15 to 30 ,,	[0·6 to 1·2 in.]	— 13·7 ,,		

Consumption, 2 tons per sq.m. per hour [about 2 tons per 10·8 sq.ft.].
Clinkering every 35 to 40 minutes.

After run of Minutes.	Volume of CO_2 p.ct.	Volume of CO p.ct.	
6	8·0	22·0	Hydrogen and methane not determined.
11	6·7	23·9	
17	7·8	21·6	
22	6·3	24·6	
28	6·1	27·1	

Example II.

Material used: Coke clinker, 59·6 p.ct. combustible.
40·4 ,, ash.

Size				
0 to 5 mm.	[0 to 0·2 in.]	— 52 p.ct.	} 94 p.ct. below 0·6 in.	
5 to 15 ,,	[0·2 to 0·6 in.]	— 42 ,,		
15 to 30 ,,	[0·6 to 1·2 in.]	— 6 ,,		

Consumption, 155 tons per sq.m. per hour [about 1·55 tons per 10·8 sq.ft.].
Clinkering every 90 minutes.

After run of Minutes.	Volume of CO_2 p.ct.	Volume of CO p.ct.
5	6·8	24·2
17	6·0	26·4
30	5·8	26·9
44	5·5	27·6
61	5·7	27·2
76	5·9	27·0

As it is a question of gasification with air and without the addition of steam, it is considered that the carbon dioxide and monoxide contents are sufficient indication of the quality of the gas.

These results, says the author, from a new method of profitably

using very low-grade fuel would appear to be of far-reaching importance. An efficiency of 95 to 97 p.ct. has recently been achieved, and the statement that a producer process with such fuel was possible not in spite, but really because, of the high percentage of ash, might give rise to considerable doubt but for the fact that the above results have been obtained, and that they form the basis of the firm's guarantees. It is equivalent to a process which would separate-out more than 80 p.ct. of combustible fuel from clinker. The fact that several firms have already determined to employ the plant in connection with new boiler installations would seem to prove that the extraordinary fuel economy outweighs, in their opinion, the question of additional capital cost.

THE CARBON MONOXIDE BOGEY ABROAD.

Recriminations.

The differences on the above-mentioned subject between our two French scientists and the consulting engineer, an account of which appeared last week in these columns, have been followed up, though in places they have regrettably descended from the realms of technicality almost to personality.

MM. Kling and Florentin again took up the matter strongly in the November "Chimie et Industrie." They had been challenged, although the experiments they had carried out were intended simply for their own ends. Their objects were scientific conclusions, not applicable to general practice. It was up to them to reply to criticisms, as they and M. Grebel had regarded the matter from an entirely different standpoint; and indeed their statements naturally merited attack from him. It was, however, rash of M. Grebel to disregard scientifically established facts, or in any way to minimize their effect. They (MM. Kling and Florentin) were but scientists who pushed prudence to the extreme of considering as valueless results founded on any discrepancy of experiment. Their "cupboard" had excited M. Grebel's scorn and severe criticism; but they begged to draw the parallel of the investigator who had to examine particles so minute that they could not be seen with the naked eye but had to be magnified on the slide of a microscope. They, too, might have used a room of such a size as to render unnoticeable the traces of carbon monoxide which formed the subject of the present argument; but this they would not do, for by such methods, in their estimation, nothing at all would have been proved. As scientists they deemed it necessary in all their research to have: 1. An instrument exactly calibrated. 2. Its degree of accuracy established. 3. Reasonable relation between what they were measuring and the instrument they employed.

M. Grebel had criticized their utilizing the blood test in their experiments; but their wish for exactitude demanded the greatest *finesse*—hence their "cupboard." It was stated that their experiments must have entirely falsified conditions of combustion; but they would point out that all their measurements of the carbon monoxide had been made after an average time of half-an-hour. In fact, with burners of large consumption (250 litres per hour) the test had been closed after a quarter-of-an-hour, while only with burners of small capacity (45 to 60 litres) did the period reach one hour. As a matter of fact, the carbon monoxide content in both cases usually appeared higher after half-an-hour—an anomaly explained by the percolation inevitable through the door of the room.

Their methods and their point of view were so entirely different from those of M. Grebel that it was unlikely they would ever agree. No useful end could be served, they considered, by arguing until M. Grebel produced experiments showing results at variance with their own. Till then they held their ground. Nevertheless, no harm would be done in now stating what had been the object of their work. They belonged to the category which had always considered that the harm done by small escapes of carbon monoxide was exaggerated, and that in consequence it was of little matter increasing its content in town's gas by the addition thereto of water gas. In fact, some of the observations had led them to think that providing odorization ensured that leakage was at a minimum, the carbon monoxide which might leak from service pipes would probably be less than that generated by a number of appliances on that service. Thus, if there existed these two sources of poison, it would appear foolish to attack the former and not the latter; and this was an interesting point to work on. Such was the object of their investigation, which had been reported to the Academy in 1919, and which had now given birth to all this criticism.

After a short recapitulation of their case, reference to the use of flueless gas-fires, and to the service which gas can render to the community, they closed: "We are not alone in calling attention to the danger of carbon monoxide in confined spaces in which burners of various grades of gas or of liquids function. Whatever M. Grebel may think, hygienists are practically unanimous on the point."

Under the heading "Second and Final Note on the Combustion of Gas in Confined Spaces," the "Journal des Usines à Gaz" of Jan. 5 publishes further comment by M. Grebel. The discussion throughout, albeit petty and one which might not be taken seriously by the English temperament, nevertheless embodies some points of interest—especially now, when all who know and many who do not know are interesting and busying themselves over this vexed question. The following is an abstract of M. Grebel's reply to the above.

"I should not have again replied to MM. Kling and Florentin, were it not for the foreign circulation of "Chimie et Industrie;" but we cannot let it be thought abroad that we in France know nothing of the elements of the combustion of gas. In order the more easily to refute my criticisms, which I purposely confined to their absurdly small room, they have adopted the old procedure of distorting their opponent's arguments. I never confessed disregard of carbon monoxide content, but preferred to leave such a subject for discussion by scientific men. MM. Cambier and Marcy are, I believe, at the moment collecting fresh data on the matter. I never attacked MM. Kling and Florentin, but merely pointed out that it was hardly right to draw conclusions unfavourable to gas from experiments carried out in such abnormal circumstances.

"As for their suggesting that I should come forward with conflicting experiments, it is hardly necessary that one who has had such wide experience in the industrial uses of gas should do so before questioning the validity of such conclusions as theirs. One thing, however, must be remarked. They state that their tests were often discontinued after half or a quarter of an hour. But every scientist, engineer, or ordinary practician knows, if he has burnt gas, that the greatest production of carbon monoxide takes place at first, before the bodies warmed attain the temperature of the water gas resulting from the primary combustion."

M. Grebel then proceeds to make several further criticisms of their work. The duration of their experiments was too carelessly defined for accuracy; and their explanation of percolation through the door was hardly sufficient for a carbon monoxide content higher after a quarter than half an hour. Their statement that burners of high capacity produced but "traces" of carbon monoxide hardly tallied with the conclusion (in their September article) that "to a great extent the production of carbon monoxide was proportional to the consumption or rather to the volume of the flame." These and other discrepancies in their case only confirmed M. Grebel in the opinion of the great Poincaré: "Scientific research consists in observations—careful observations; and better far to keep away from it than to make discoveries liable to false interpretation." (Science et Méthode.) Although not the accredited representative of the gas industry, M. Grebel was glad his intervention had drawn some profession of their faith from MM. Kling and Florentin.

DIGEST OF PATENT CASES.

The digest of patent cases reported in 1921, edited by Mr. Frank G. Underhay, Barrister-at-Law, and issued as a supplement to the "Illustrated Official Journal (Patents)," records several decisions upon applications for extensions of patents. One application had reference to a patent which had expired two years previously. Evidence was adduced of the interference to the business caused by the war; and an extension of four years was granted. In one application, however, in connection with a patent which had expired three years before, it was refused, on the ground that, especially in view of the exceptional case which an applicant must make out so as to obtain an extension of a patent that had expired for three years, the evidence did not establish a *primâ facie* case for an extension. Quite a number of instances are quoted in which extensions were granted of unexpired patents—and several others relating to expired patents—proof having been forthcoming of the injurious effects of the war on the demand for the inventions or on the facilities for manufacture.

Difficult points are frequently raised in actions for infringement. In two cases it was held that defendant's invention did not possess one of the essential or characteristic features of the plaintiff's patent; but in another matter, the plaintiff's patent being for the combination of six elements, and the defendant's machine being held to contain every element of the combination, with the exception that a certain valve was in a different position, it was decided that the variation was insufficient to distinguish the two machines, and that the defendant's machine was an infringement. In another application, the invention of a combination, though all the elements were old, was held to have subject-matter, and to be useful; so that the patent was valid. A rotary engine having as an alleged novel feature toothed blades arranged in a form of continuous helices, failed to secure a certificate of validity; it being held that this was a known equivalent of a stepped helix. Others may take heed of the fact that a patent was held to be invalid for insufficiency of description in the specification as to the manner of working.

A New Welding Society.—Members of the various sections of the welding industry, at an inaugural meeting held on the 26th ult. at the Holborn Restaurant, adopted the proposal to form a new Welding Society embracing all systems of welding. A strong Committee, with power to add to their number, representing the different interests, were elected to draft the constitution, with a view to registration after approval by a general meeting which will be called at an early date. The name agreed upon is the Institution of Welding Engineers; and all interested in the welding and allied industries will be eligible for membership. The offices (*pro tem.*) are at No. 30, Red Lion Square, London, W.C. and the Hon. Secretary is Mr. C. Raggett.

DEPOSITS IN GAS PIPES AND METERS.

Report for 1921 of the American Gas Association Committee.

This report of the Committee on Deposits in Gas Pipes and Meters is a brief summary of information and conclusions, as received during the year from gas companies, and is in the nature of a progress report only. A questionnaire letter was prepared by the 1921 Committee and sent to 52 of the largest gas companies in the United States. Forty-three replies were received; this being equivalent to 82·7 p.ct. of the total number.

The replies from these companies may be divided into two general classes. First, those stating that trouble, in various degrees, was being encountered; and, secondly, those who were having no trouble from deposits. Of the former class, 37 companies are having trouble with deposits, while six are experiencing no trouble at the present time. The kind of gas being sent out by the companies reporting deposit trouble is as follows: 21 companies send out mixed coal and carburetted water gas in various proportions; 4, straight coal gas; 10, straight carburetted water gas; and 2, straight oil gas.

The deposits ranged in volume from "very little" to "a large amount." Some companies report that deposits are tarry in nature; others, their belief that naphthalene is the chief cause of stoppage; while others, and by far the larger number, state that the deposits are "dry" to "slightly moist," and have the appearance of iron rust.

Some companies mention that they encounter no trouble from stoppages near the works, but only in outlying districts; while others say that all their trouble lies within one mile of the works, with no trouble beyond that point—the opinion being that all impurities have been deposited before reaching the outlying points, and that this may be due to ground temperature.

A number of companies have no trouble in their low-pressure systems, but do experience trouble with high-pressure service, which is attributed to the high velocity of the gas; and deposits from high-pressure systems show a large percentage of carbon. On the contrary, however, other companies are having stoppage trouble only in their low-pressure systems. Many of the companies have stoppage trouble seasonably—beginning in August or September, and continuing through the winter months. Others report that their trouble is evenly distributed over the entire year, being attributed in most cases to their geographical location.

Several companies reported that during the extreme cold weather during 1918-1919, when their outputs of gas taxed the capacity of their plants, the formation of deposits in gas-pipes was excessive; and some say that, where coal gas was the principal gas sent out, they were troubled with heavy naphthalene deposits, no iron rust being encountered. A few companies reported that they believed that corrosion was caused by electrolytic action brought about by the presence of cyanogen or sulphuric acid on the metal. Others stated that in their belief carbon dioxide, oxygen, ammonia, cyanogen, and sulphur compounds in the presence of moisture were the prime factors in corrosion. Three companies have been troubled with a deposit not unlike iron-carbonyl; but the trouble disappeared in a relatively short time, and they were unable to examine these deposits.

The question was raised by some undertakings who manufacture and distribute carburetted water gas only, why cyanogen is found in such comparatively large amounts in deposits, when carburetted water gas contains a mere trace of cyanogen. The answer to that may be briefly given: Ammonia and carbon bisulphide, though these are found in only small amounts in purified water gas, interact, resulting in the formation of several compounds of ammonia, cyanogen, and sulphur; and, to go further, a reaction takes place between the oxygen of the gas and ammonium polysulphide formed by the interaction, whereby ammonium thiosulphate and free sulphur are formed. All of the compounds thus formed will attack metal.

To confirm this belief, the following test has been made: Ammonia and carbon bisulphide vapours in the presence of moisture were passed through a 2-in. gas-pipe for a period of some weeks. At the end of this time, a large amount of deposit was removed from the pipe, and on analysis was found to consist essentially of iron rust, cyanogen mainly in the form of prussian blue, and free sulphur.

Internal corrosion in iron pipes may be brought about in at least six different ways. The first five are active in the presence of water vapour. In the case of the sixth, water vapour is not necessary: (1) By hydrocyanic acid; (2) by products resulting from interaction of carbon bisulphide and ammonia; (3) by excess oxygen; (4) by carbon dioxide; (5) by sulphur dioxide; and (6) by dry carbon monoxide acting on metallic iron.

Oxygen and carbon dioxide are intimately associated in bringing about corrosion. Oxygen, above all, will act to a certain degree, but will be accelerated by the presence of carbon dioxide and moisture. The oxygen unites with metallic iron, and forms ferrous oxide. This, in the presence of water vapour, unites with the carbon dioxide, and forms hydrated ferrous carbonate, soluble in water. This ferrous carbonate takes up more oxygen, and forms ferrous oxide, liberating water and carbon dioxide in the free state. This leaves the latter free to attack more iron; and the process is repeated.

It is doubtful if sulphur dioxide is present in carburetted water gas when ready for distribution. Sulphur dioxide, which is formed during the manufacture of blue water gas, combines with the ammonia brought about by the cracking of the oil to form sulphide and sulphate of ammonia; and these salts are washed out of the gas when the latter passes through the seal-pot, containing water, at the outlet of the water-gas sets.

Analyses of deposits that were made as a result of this investigation show that they consisted principally of iron oxides (iron rust), compounds of iron with ammonia, cyanogen, and sulphur, with varying amounts of light oils, tarry matter, free carbon, naphthalene, free sulphur, compounds of sulphur, ammonia, cyanogen, and moisture. Foreign matter, as lime and silica, was also encountered. These analyses indicate that the deposits are primarily due to chemical action of small amounts of impurities in gas distribution on iron pipe.

Of the companies reporting that they are having no trouble at the present time with deposits, four say that, though they have had trouble to a great extent, the addition of more cooling surface and purifying capacity has proved an effective remedy. This leads to the belief that the trouble may lie in the works, and not in the distribution system. Spraying a volatile oil, such as kerosene, into the mains, may relieve the trouble somewhat; but it is doubtful if this will prove an effective remedy. One company report that they have used kerosene sprayed into the mains at the rate of 3 gallons per million c.ft., with good results—especially in so far as their meter troubles are concerned. Other companies are trying-out this method; but no results are yet available.

It has been shown in this report that certain impurities in gas will cause corrosion. It is the belief that corrosion may be checked by better condensation of these impurities in the works. To bring this about means additional expense in providing more cooling surface and purifying capacity; and whether this is warranted, as against the expense incurred for cleaning-out stoppages and at times renewing gas pipes and services, as well as renewing meter-diaphragms and metal parts, can be decided only by each individual company.

The matter of deposits and corrosion in consumers' meters has only been lightly touched on this year, though some data have been received regarding a substance found in the consumers' meters which resembles cumarone.

Storage of Helium.

Mention has recently been made in the "JOURNAL" of the experimental plant at Petrolia, Texas, for separating helium from natural gas. The gas is deprived of its helium, and is then transferred to a local gas company for distribution. The helium may be taken in this way without impairing the burning or lighting qualities of the gas for domestic use; and therefore the Government only pay for the actual loss of gas during the process. Storage of helium offers a knotty problem; initial outlay and upkeep representing a financial obligation of substantial proportions. Storage of this rare gas is being attempted in concrete chambers in coal mines; an experimental arrangement having been devised at the Pittsburgh laboratory of the Bureau of Mines. The container consists of a concrete chamber located in a drift, with reinforced concrete ends and a manhole. The container is lined with sheet copper, to prevent diffusion of the gas through the concrete. Storage is desirable under a pressure of 400 or 500 lbs.; and the walls of the drift, of course, contribute the major portion of the resistance. Another suggestion offered for the storage of this gas is the use of salt deposits in New York; the proposal being to bury a chamber in the rock-salt beds, some of which are 60 ft. thick. It has, however, not yet been determined whether salt could seep through the chamber, and come into contact with the gas. Separation of helium from the natural gas involves the application of a refrigeration process which will liquefy everything present except the desired product.

Gas-Works Chemistry.—At the Royal Society of Arts next Wednesday evening (Feb. 8), Mr. Edward V. Evans, O.B.E., F.I.C., Chief Chemist to the South Metropolitan Gas Company, will read a paper on "Some Solved and Unsolved Problems in Gas-Works Chemistry." Sir Arthur Duckham, K.C.B., M.Inst.C.E., will be in the chair.

Turbo-Boosters and Exhausters for Town Gas.—In the last issue of "Engineering," there is an article on this subject which opens by saying that, in the early developments of the use of high-pressure in the distribution of town gas, the pressure was raised by rotary compressors of the Root's blower class or by means of reciprocating compressors; and a very large number of such plants were installed and are still in operation. During recent years, however, there has been a tendency to employ compressors of the turbo-blower pipe, which in many cases offer advantages in connection with driving and in the avoidance of pressure oscillations. A leading part in this class of work has throughout been taken by the Bryan Donkin Company, Ltd., of Chesterfield, and their plants are to be found in all parts of this country and abroad. Messrs. Bryan Donkin's earlier work in this connection is well known; and this article deals with some of the later developments, particularly in the use of Rateau turbo-blowers and fans. As the Tottenham installation forms an interesting example of the application of boosting to town gas distribution, reference is made to the conditions which had to be dealt with there.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Carbon Monoxide and the Institution of Gas Engineers.

SIR,—In "The Times" on the 13th inst., Dr. Haldane wrote suggesting "that gas engineers should themselves organize a thorough investigation into the precautions needed in connection with increasing percentages of carbon monoxide in domestic gas."

In the same paper on the 16th inst. Dr. Carpenter, in supporting Dr. Haldane, stated that "the Institution of Gas Engineers is in every way suitable for undertaking a searching investigation into the conditions associated with the greater percentage of carbon monoxide in domestic gas supplies;" and in the "JOURNAL" of the 25th inst. he states that he has "suggested that the proper body to inquire into the circumstances of the very unusual number of fatalities and into the particular criticisms which have been made in regard to gas supply, is the Institution of Gas Engineers."

It is very pleasing to note that Dr. Haldane, a life-long opponent of high percentages of carbon monoxide in domestic gas, shows his confidence in gas engineers, of whom he has considerable knowledge, by suggesting that they themselves should investigate the precautions needed in connection with domestic supplies containing appreciable quantities of this gas. While recognizing the fairness of his suggestion, I would point out that it has always been the claim of gas engineers that they have adopted only such supplies and appliances as careful investigation and examination have shown to preserve a very large factor of safety, and they will undoubtedly continue to make the best use of their accrued experience in devising methods for the safe use of gas.

Dr. Carpenter, while supporting Dr. Haldane's suggestion, carries the matter very much further; in fact, the terms of his proposed investigation are too wide, in my opinion, to be adopted.

The Institution of Gas Engineers, along with representatives of the National Gas Council and the Gas Companies' Protection Association, gave scientific evidence, as well as facts from practical experience, before the Board of Trade Committee, why there should be no restrictions in the composition of the gas to be supplied for domestic purposes. The Committee, after hearing evidence from those desiring restriction, issued a report expressing concurrence with the views of the Institution, and the whole industry has expressed in no uncertain manner its unanimous satisfaction with the report.

Having obtained a decision which the Institution considers is right, it could take no steps which might indicate the slightest doubt as to the finding of the Board of Trade Committee.

To maintain the present position of the industry, it is necessary to be prepared for further attack, and it is essential that:

(1) The fullest information of the facts of every case of gas poisoning should be obtained, and
(2) Mains, services, fittings, and appliances should be constructed, maintained, and operated so as to make accident from leakage practically impossible.

Investigations on these two matters can be carried out by the Institution with great benefit to the industry. The proposal that they should do so will be brought before the Council for their consideration.

The fact that there have been some cases of gas poisoning since the publication of the Board of Trade Committee's report, has apparently led the Daily Press to think that gas containing much larger percentages of carbon monoxide is being supplied to the public.

It is, however, a fact that the quantity of carbon monoxide in the gas supplied at the present time is generally less than it was for several months previous to the issue of the carbon monoxide report.

Institution of Gas Engineers, T. HARDIE, President.
28, Grosvenor Gardens, S.W., Jan. 30, 1922.

The Late Mr. John West.

SIR,—May I, through the medium of your columns, express on behalf of all the members of the West family our heartfelt gratitude and warm appreciation of the many expressions of esteem and affection for our late father, and the sympathy extended to us in our loss.

It would be very difficult to reply individually to all the letters and messages we have received; but we should like to convey to those who have written, to those who assembled in his honour at the funeral, and to the Technical Press for its generous and discerning tribute to his wonderful life, our sincere thanks for the spontaneous outburst of sympathy, which has been so helpful and consoling in his passing from us.

Springfield, Holly Road, Wilmslow, FRED. J. WEST.
Jan. 24, 1922.

Review of "The Distribution of Gas."

SIR,—It would, perhaps, be unfitting in me to complain of strictures passed, in an otherwise very favourable review published in your last issue, on my dealing with the subject of discharges and governors. It is neither my desire nor intention to be drawn into any public discussion with the unknown writer; and I would not trouble you at all now, but that in so many minds silence is supposed to give consent. On the contrary, those who will take the trouble to place text and review side by side will find that the latter is itself fully as open to criticism as the matter it criticizes.

I will content myself with drawing attention to just one case, which admits of instant verification from another part of the article, "as a sample of the rather loose way" (to quote the reviewer's own words) in which parts of the review have been written. Near the bottom of the right-hand column of p. 206, the writer says: "It is strange, however, that the author has missed reference to the Nuneaton 'Pleno' burner," &c. If your readers will turn to p. 368 of "The Distribution of Gas," they will find a fairly full account of the "Pleno" boiling-burner, cooker-burner, and burner for steam raising, with four illustrations, altogether amounting to a couple of pages.

As I said at the commencement of this letter, I have no intention of being drawn into correspondence with the reviewer of my book. I now leave the matter to the judgment of my readers.

WALTER HOLE,
Leeds, Jan. 28, 1922. Superintendent.

[We tender our apology to Mr. Walter Hole. Our reviewer was unfortunately indisposed during the writing of the article, and must have picked up the third edition of the book in mistake for the fourth, when looking through the chapter on "Gas Fires and Cookers." No other explanation is possible, for he could not otherwise have missed the reference to, and illustrations of, the "Pleno" burner. These are, moreover, included in the excellent index. We thank Mr. Hole for pointing out the mistake, and for giving further confirmation of our reviewer's opinion that it is generally possible to find in the pages of "The Distribution of Gas" some reference, either brief or extended, to whatever subject or apparatus one may desire to look-up within the range of the book.—ED. G.J.]

Gas Consumers and Assurance as to Therm Value.

SIR,—In your comment on the letter written by Mr. Pardoe, of Angmering [p. 201], you say that there is "ample publicity" of the Official Gas Referees' reports on the maintenance of the thermal efficiency of the gas.

May I ask you where this publicity obtains? It is not copied on the quarterly bills of the Gas Light and Coke Company, nor is there any mention of the matter on the bills of the Gas Company in the town where I have a house. I have not seen any notices in the windows of the gas companies' showrooms in and round London.

I think I am justified in saying that the great majority of gas users have no idea if the gas they have to pay for is above or below the agreed standard.

Should it be proved in any district that the efficiency had dropped, would the company concerned have to allow a rebate to consumers?

98, *Victoria Street, S.W., Jan. 30, 1922.* P. BENHAM.

P.S.—In the old days of the water companies, reports on the purity, &c., of the water used to be given in the papers after examination by official analysts. We get none now. "*Quis custodiet . . . ?*"

[If our correspondent will read the prescription by the Gas Referees published in the "JOURNAL" for Nov. 16 last [p. 487], towards the end he will see what has to be done in the way of publishing gas examiners' reports. As to the last paragraph of the letter, our correspondent is confusing "efficiency" with calorific value. The Gas Regulation Act provides for the procedure in the case of deficiencies of declared calorific value; and the duty rests upon the local authorities to see that there is compliance by the gas suppliers with their obligations. If Mr. Benham is dissatisfied, he should raise the point with his local authority.—ED. G.J.]

Domestic Coke-Grate Combined with a Gas Firelighter.

SIR,—Many people believe that, given a suitable grate, gas-works coke, with its universality, would, in the shortest space of time, give to us our much-sought smokeless towns and clearer atmosphere. Therefore it is to be hoped the recent controversy in the "JOURNAL" will awaken an interest so that we shall very soon see domestic coke-grates in use in gas-works showrooms, particularly where they have the dry, porous coke from continuous vertical retorts.

As one of the difficulties in the use of coke in the home is its slow ignition properties, could not gas be adapted in any new design of grate both to kindle and revive the coke-fire, and thus still further popularize the use of coke and gas? Our electric friends have not yet introduced the competitive electric firelighter, whence it would seem, with a well-designed gas lighter, gas could be applied for the kindling of solid fuels, in all existing coal-grates. The writer has so utilized gas for 17 years; and while there is nothing new in the idea, it is surprising how really few applications exist, and how little known is this simple labour-saving device.

Jan. 28, 1922. AD REM.

Discontent in Thornaby.

The Thornaby-on-Tees Corporation have decided to send a deputation to Stockton regarding the price and quality of the gas supplied by the latter authority. Mr. Oxberry, who brought the matter forward, pointed out that two or three years ago, when the price of gas was 3s. per 1000 c.ft., the price of coal was considerably more than to-day. Wages were higher; and yet at that time the Stockton Corporation made a profit of £10,000. Twelve months ago, Stockton was able to supply gas at a very low figure; and if that was possible then, why should they now be compelled to pay 4s. 11d.? He thought they had a right to ask Stockton this question. Consumers in Thornaby were beginning to get exasperated about the quality of the gas. With unemployment so rife, the abnormal charge was nothing more or less than taking bread out of children's mouths. Mr. Shepherd thought Thornaby should make a demand for a fuller and better supply. Stockton once promised them 25 to 50 p.ct. more pressure; but this promise had never been fulfilled. The deputation is to consist of the Mayor, Alderman Walton, and Mr. Oxberry.

The British Gas Light Company have removed their chief office to No. 2, Abbey Gardens, Westminster, S.W. 1.

REGISTER OF PATENTS.

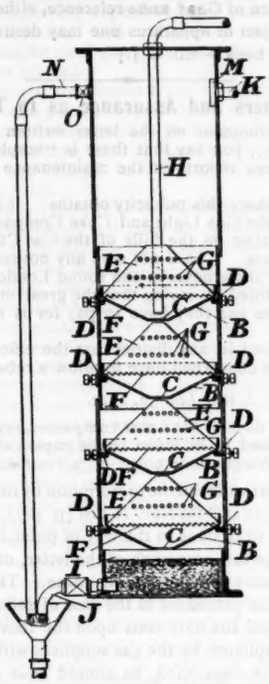
Separating Liquor from Tar and Oils.—No. 172,783.

GLOVER, S., of St. Helens, WEST, J., of Southport, and WEST'S GAS IMPROVEMENT COMPANY, LTD., of Manchester.

No. 27,999; Oct. 2, 1920.

This invention relates to means for facilitating the separation from tars and oils of liquor frequently found in suspension therein, without the necessity of dehydrating the tar in the usual manner.

The arrangement comprises a tower or vessel in which are a plurality of trays or saucer-like parts B having a circular hole through them at the centre. The trays are supported by the ends of screwed studs D, which project into the sides of the vessel. Upon or within each tray is supported a hollow conical element E having a hole through it at the apex of the cone; a serrated lower edge F where it rests upon the tray; and, if desired, a number of perforations G.



Glover and West's Tar and Liquor Separator.

The mixed tar and liquor is fed into the tower through the pipe H, which directs the liquid on to the apex of one of the cones, and a sump I is provided at the bottom of the tower from which the tar is withdrawn by the pipe J.

An overflow passage K is provided near the top of the tower with a scum plate M over its mouth to permit the liquor to pass out of the tower. A similar outlet pipe N, at a slightly higher level, serves for draining-off any light tarry matter which may accumulate on the surface of the liquor. The pipe is preferably fitted with a weir type of valve at O.

The mixed tar and liquor fed into the tower travels over the surface of the cones and trays, which facilitates the separation of the liquor from the mass by providing a large area over which the tar travels on its way to the bottom of the tank. The liquor separates from the tar and rises to the liquor overflow, and any tarry matter of a lighter gravity than water will rise to the surface and be drained off by N as it accumulates.

Low-Temperature Distillation of Fuel.—No. 171,909.

MERZ AND M'LELLAN, BOTTOMLEY, W. T., of Newcastle-upon-Tyne, and WEEKS, E. G., of Monkseaton.

No. 34,262; Dec. 3, 1920.

This invention relates to the low-temperature distillation of fuel where the distillation retort is heated by highly superheated low-pressure steam.

It has been previously proposed, the patentees point out, to obtain low-pressure steam for the distillation retort by bleeding steam from a steam-turbine where this was included as part of a power plant operating in conjunction with the retort. In this invention it is proposed to obtain economically low-pressure steam for the retort independently of the steam in the turbine.

In a steam-heated low-temperature distillation retort the heat required for the retort is taken from a portion of the superheat in the steam only. The remainder of the superheat and the whole of the latent heat and sensible heat remain in the steam when it leaves the retort with the gas and tar.

Were it not for the fact that the steam leaving the retort is mixed with gases and tar, it would have been possible and economical to circulate the same steam, with its latent heat and portion of superheat, through the high-temperature superheater and into the retort again; the driving force for circulating the steam being obtained by means of a fan or compressor or pressure booster of some sort.

Since, however, the steam must first be condensed, to separate it from the tar and gases, and the condensed steam contains too many impurities to be used again in the distillation process, it will be necessary to use fresh make-up water to replace the steam condensed.

According to the present invention, this clean make-up water is circulated through one element of a heat-exchanging apparatus, wherein it is evaporated; the make-up steam thus produced being passed through a low-temperature distillation apparatus, and the steam and distilled gases issuing from the distillation apparatus passed through the other element of the heat-exchanging apparatus, so that the contained heat in the steam and the distilled gases is utilized to evaporate the make-up water.

Since the quantity of make-up water required is the same as the quantity of steam condensed, the condensation of the retort steam by the make-up water can only be effected by arranging conditions so that the make-up water is substantially completely evaporated. The evaporation can be attained by keeping the pressure of the evaporated make-up water in the heat-exchanger below the pressure of the condensing steam.

The invention also includes apparatus comprising in combination a low-temperature distillation apparatus, heat-exchanging apparatus, means to pass make-up water through one element of the heat-exchanging apparatus, means to pass the make-up steam thus produced into the low-temperature distillation apparatus, with or without a low-pressure high-temperature superheater for the make-up steam before it is introduced into the distillation apparatus, and means to pass the steam and distilled gases issuing from the distillation apparatus through the other element of the heat-exchanging apparatus.

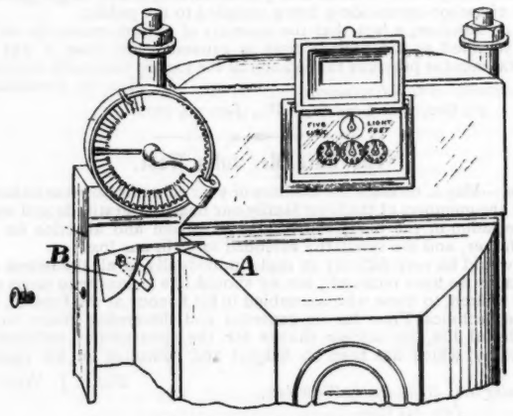
Coin-Freed Meters.—No. 173,077.

SUTHERLAND METER CO., LTD., and KING, F. H. W., of Birmingham.

No. 27,383; Sept. 27, 1920.

This invention has reference to coin-freed gas-meters of the well-known kind, and comprises simple and efficient means whereby the position of the indicating disc can very quickly be changed and fixed without unfastening any screws or the like, or detaching any separate parts of the meter. The means for rotatably adjusting the indicating disc are of the self-locking kind, which prevent the disc from being moved by force applied to the exposed portion of the disc, and are enclosed in a casing so that access thereto can be obtained only by an authorized person. Teeth are formed at the periphery of the disc, which are engaged by a worm mounted on a spindle; both being enclosed in a casing. The spindle may be provided with a head by which it may be rotated, and which may be located within the cash-box casing so that it is only accessible when the cash-box is open.

A pivoted flap on the cash-box casing, which is kept closed when the cash-box is locked in position, may co-operate with a flap on the head of the worm spindle, either to prevent the rotation of the head or to ensure that the collector leaves the head in a position wherein a definite number of units are indicated before he can secure the flap or the cash-box. The flap may be provided with a projecting portion having a hole which registers with a hole in the casing, whereby it can be placed in its closed position and locked by a screw sealed in the well-known manner. With this arrangement, the patentees point out, the collector may be authorized only to remove the money, while other inspectors may be provided with seals which enable them to make adjustments of the indicating disc.



King's Coin-Freed Meter.

The illustration is a perspective view of the latter arrangement. The flap A may be provided with a projecting side-plate B provided with a hole adapted to register with a hole in the casing, when the flap is closed. The flap can then be secured in its closed position by a screw passing through the two holes shown; and the screw can be secured by a seal.

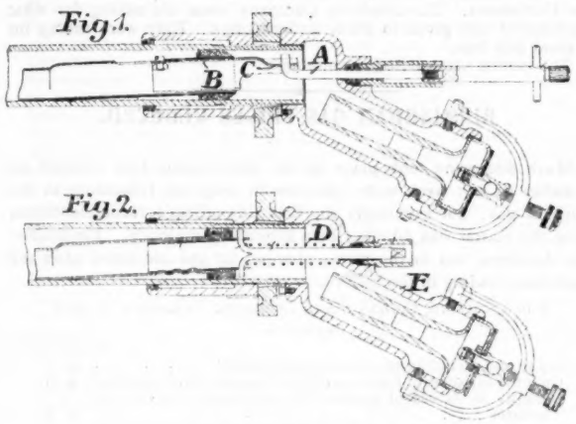
In a modification of the invention, the worm in its casing is arranged to be turned by the insertion of a special key through a key-hole in the coin-box, in which case the spindle may be horizontally disposed and would project through the top of the box to the outside. The key would be constructed to engage with the specially shaped end of the spindle, so as to turn it for the purpose of adjusting the indicating disc as required. In this case the hinged flap and also the milled head with a flat thereon is dispensed with. The key-hole may be closed and made secure by any suitable means—such as a separate hinged plate or cover, which is sealed, or which is locked and can only be opened by a special key.

Improvements in Gas-Burners.—No. 173,126.

KEITH, J. & G., of Farringdon Avenue, E.C.

No. 30,321; Oct. 27, 1920.

This invention relates to improvements in tubular gas-burners divided into two chambers such as described in patent No. 13,836 of 1915. The outer chamber has one or more longitudinal slots; and at the inlet end of the inner one is arranged a valve adapted to allow part of the gaseous mixture admitted to the chamber to pass direct to the outer chamber and thence to outlets, without passing through the inner chamber. According to the present invention the injector body or casting, which is screwed or otherwise fitted on to the end of the burner tube, is inclined to the axis of the burner tube, being preferably bent downwards, so as to clear the valve spindle which projects to the exterior of the burner tube, permitting the control of the distribution of the gas while the gas is actually burning. The bending downwards of the injector serves also to reduce the liability to fouling of the mixture by oven products passing out of the usual inspection doors when opened.



Keith Gas-Burners.

In the accompanying drawings, fig. 1 is a vertical section of part of a burner in which the valve is constituted by a push-and-pull sleeve. Fig. 2 shows a modification in which the valve is constituted by a rotary sleeve. In the form shown in fig. 1 the valve spindle A is disconnectible from the sleeve B by turning-up the inner end of the spindle which passes through a hole in an extension C of the sleeve. The outer end of the valve spindle, which is screw-threaded, is protected by an extension of the gland which permits operation of the spindle by a removable key. In the form shown in fig. 2 the inner end of the spindle is split so as to form a tee head engaging with cross-cuts in the end of the sleeve, and is retained in engagement by means of a spring D pressing it inwards. In this form the outer end of the spindle is suitably shaped so as to be operable by a key. In both forms the injector body or casting E is bent downwards.

With this construction the distribution of the gas may be controlled in a manner similar to that aimed at by patent No. 13,836 of 1915, with the advantage, however, that the control may be effected while the gas is actually burning.

Treatment of Gas Liquor to Extract a Fertilizer. No. 153,006.

GESELLSCHAFT FÜR LANDWIRTSCHAFTLICHEN BEDARF G.M.B.H., and Dr. MANDELBAUM, of Munich, Germany.

No. 30,160; Oct. 25, 1920. Convention date, Feb. 24, 1919.

It is a well-known fact that gas liquor acts so poisonously on many plants that it cannot be used directly as a fertilizer. Even at very great dilution it injures certain sensitive plants, so that its fertilizing effect is far behind the actual fertilizing value of the constituents of the liquor. By the present invention the patentees claim that an excellent fertilizing effect is attained, even on very sensitive plants, if the liquor is mixed with yellow ammonium sulphide or sulphur, or is treated with air for the purpose of separating sulphur from the sulphur compounds which it contains, and is then distilled in order to obtain the liquid fertilizers.

This good result is not obtained by distilling the gas liquor without the presence of sulphur or ammonium sulphide, because, although the small proportion of ammonium sulphocyanide present remains in the retort, the considerably larger proportion of ammonium cyanide does not, and this also acts as a plant poison. If, however, the distillation occurs after the addition of sulphur or ammonium sulphide, which converts the cyanide into sulphocyanide, the distillate is quite free from both cyanide and sulphocyanide.

The quantities of sulphur or yellow ammonium sulphide to be added to the liquor depend on its composition. With a liquor containing, for instance, 0·8 p.ct. of hydrogen sulphide in the form of ammonium salts and 0·07 p.ct. of hydrogen cyanide, the oxidizing action resulting from the treatment with air or oxygen is sufficient to separated sulphur from the compounds contained in it, before the product is distilled. But when the liquor contains (say) 0·2 p.ct. of hydrogen sulphide and 0·07 p.ct. hydrogen cyanide, it is necessary to add up to 1 p.ct. of ammonium sulphide or 2 p.ct. of sulphur.

The patentees are aware that the well-known reaction between ammonium cyanide and sulphur has been applied for fixing the latter in many industrial processes.

MISCELLANEOUS NEWS.

GAS REGULATION ACT APPLICATIONS.

The following further notices have appeared in the "London Gazette" of applications under the Gas Regulation Act.

Killamarsh Gas Light and Coke Company, Ltd.

The maximum price now authorized in respect of the supply of gas by the undertakers is 5s. per 1000 c.ft.; and the price they have asked the Board of Trade to substitute for this is 1s. 6·6d. per therm.

Neath Corporation.

The maximum price now authorized in respect of the supply of gas by the undertakers is 6s. 6d. per 1000 c.ft.; and the price they have asked the Board of Trade to substitute is 1s. 4·67d. per therm.

Pontypool Gas and Water Company.

The maximum prices now authorized in respect of the supply of gas by the undertakers are: (1) within the portion of the limits of supply which is defined in section 4 of the Pontypool Gas and Water Act, 1873, a price of 5s. 6d. per 1000 c.ft., and (2) within the portion of the limits of supply defined in section 4 of the Abersychan Gas Order, 1873, a price of 6s. per 1000 c.ft. The price which the Company have asked the Board of Trade to substitute for these prices is 1s. 6d. per therm throughout the whole of their limits of supply.

SPECIAL ORDERS.

Felixstowe Gas Light Company.

The Company are making application for a Special Order to empower them to erect and extend gas-works, &c., on land scheduled, to pay pensions, and to adopt co-partnership.

Uxbridge, Wycombe, and District Gas Company.

Application has been made by the Company for a Special Order to authorize them to acquire the undertaking of the Great Marlow Gas Company, Ltd., to supply gas in that Company's area, to use certain land for gas-works purposes, and to regulate the supply of gas.

THE REFRACTORIES ASSOCIATION.

At the annual dinner of the Refractories Association, held in the Royal Victoria Station Hotel, Sheffield, the toast of "The Association" was proposed by Sir William Jones, who, recalling the period when he was in charge of the Refractory Materials Section of the Ministry of Munitions, said he looked back with the greatest possible satisfaction upon his relations with the members of that trade. He was glad to learn that the Association did not exist to regulate prices, because such a policy would limit its usefulness, and the members could not long withstand the inexorable law of supply and demand.

The President (Mr. W. J. Gardner), acknowledging the toast, said that before the war they were constantly being told that America and Germany could make better refractories than could the British manufacturers; but, thanks to the scientific research work of men like Mellor, Rosenhain, Rees, Fearnsides, Cobb, and others, this country now supplied a better article than the Americans or the Germans.

The membership of the Association now comprises fifty firms and individuals engaged in the refractory and silica-sand trades. A deputation from the Association who met the railway officials in regard to the new classification gained substantial concessions. All the raw materials of firebricks will now be in Class B, instead of some of them having to pay the higher rates in Class A, as was originally proposed by the companies.

Darlington Reduction.

The Gas Committee of the Darlington Corporation last Friday week decided to recommend a reduction in the price of gas for the current quarter, as from the last meter readings, by 7d. per 1000 c.ft. This makes the net price for ordinary consumers 3s. 6d. per 1000 c.ft. An increase of 4d. was made last July, bringing the price to 4s. 1d., as against 4s. 5d. at Sunderland and 4s. 11d. at Stockton. It was then suggested there might be a big loss by March, but from the reduction now recommended it would appear that the outlook has become better.

Beighton Gas Company.—The Beighton (Derbyshire) Gas Company have given notice of a reduction in the price of gas. Slot meter consumers have been notified that they are to receive 12 c.ft. of gas for one penny in place of 10 c.ft. hitherto; but there is to be no discount on accounts paid, so that the price will be 7s. per 1000 c.ft. A notification has been sent to the ordinary meter users that the price of gas will be reduced from 7s. 6d. to 6s. 3d.; but in addition charges of 1s. 3d. to 2s. 6d. a meter per quarter will be charged. Meters have hitherto not been charged for by the Gas Company.

Dealing with Complaints at Cambridge.—Writing to the Cambridge Town Council, Mr. Auchterlonie, the Engineer and Manager of the Cambridge Gas Light Company, says: "If any householder in Cambridge is suffering from a deficient supply of gas, it must be due to a partial stoppage in the service pipe or defective pipes or fittings in the building. It is my practice each year to have the pressure of gas in every district taken during the hours of maximum demand. This was done during the last days of November and the first days of December this winter; and our records show that there is ample pressure of gas throughout the whole of the Borough. If the parties who complain will furnish me with particulars of any defect, the matter will have our usual prompt and careful attention. I shall be pleased to furnish you with a report on the cases if you will let me have them."

SHEFFIELD GAS COMPANY'S NEW BILL

Shareholders' Approval.

At a Meeting of the shareholders of the Sheffield Gas Company last Wednesday—Col. H. K. STEPHENSON, D.S.O., M.P., presiding—approval was given to the Bill which the Company are promoting in the ensuing session of Parliament.

The CHAIRMAN, in explaining the provisions of the Bill, remarked that it ought not to be opposed by the Corporation or other interests, because while it would authorize an increase in dividends in certain circumstances, it would at the same time contain inducements to the shareholders and employees to bring down the price of gas. Under the Gas Regulation Act of 1920, the Company obtained a maximum price of 1s. 1·6d. per therm, under which dividends payable on the "A," "B," and "C" stocks were limited to 5 p.c., subject to reductions in the case of "B" and "C" stocks, and of any ordinary shares or stock forming part of £600,000 capital authorized but not yet raised, if the Company's general charge for gas exceeded 1s. 0·4d. and 10·6d. respectively per therm. By the Bill which the Company were promoting, a basic price of 9d. per therm was fixed (revisable after 1926 by the Board of Trade), with a basic rate of dividend in the case of the existing "A," "B," and "C" stocks of 5 p.c. per annum, and, in the case of ordinary shares or stock issued after the passing of the Act, such rate per cent. (not exceeding, except with the consent of the Board of Trade, 7 p.c.) as might be authorized by the resolution creating the shares or stock. At the end of each year (or half year, if the Company kept half-yearly accounts), a calculation should be made of the amount (if any) by which the total sum paid or payable by consumers for gas supplied during the period was less than the total sum which would have been payable if the gas had been charged for at the basic price. The amount so calculated was called "the consumer's benefit." If, and so far as, the balance standing to the credit of the net revenue account (after providing for dividends on preference capital, if any, and dividends at the basic rates on the ordinary capital) in the opinion of the Directors permitted, a sum not exceeding one-third of the consumer's benefit should be applied in two equal parts for the benefit of the holders of ordinary capital and for the benefit of the employees. The sum to be applied for the benefit of the holders of ordinary capital might be applied in the increase of the dividends above the basic rates, or carried to the reserve fund; while the sum to be applied for the benefit of the employees should be carried, in such proportions as the Directors deemed proper, to the superannuation fund and to a fund to be formed in connection with any profit-sharing scheme which might be established, or wholly to that fund. Any fund formed in connection with a profit-sharing scheme should be credited to the employees participating in the scheme as a uniform percentage of bonus on the total salaries and wages of the employees. A fair proportion of the superannuation fund was to be distributed among employees who were not contributing members of it, so that none would be left out. Referring to the clause which provides that the Directors' fees in any year should not exceed £4000 in amount, he mentioned that those fees had not been increased for about twenty years, and, when taxation was taken into consideration, £4000 would not be equal to what they used to be twenty years ago. What the Bill really did was to give a statutory right to the employees and the shareholders to an additional share in the profits, if the undertaking was carried on economically and the cost of producing and supplying gas was thereby reduced. The basic price was to be 9d. per therm, and at this figure there would be nothing beyond the 5 p.ct. as the ordinary dividend. Whatever reduction the consumer obtained, the shareholders and employees would be entitled to divide a quarter of the reduction between them. The Directors believed that this must be an incentive to economical output, and be beneficial to the consumers. They were almost bold enough to say that in principle it ought to be supported by the Corporation instead of being opposed. He did not think the Corporation would oppose, and he hoped they would support it. The right of the shareholders to an additional share in the profits if the cost of gas was reduced had long been recognized by Parliament as proper, and had for many years been given effect to by the usual sliding-scale clause. He believed it was correct to say that a large majority of the more important gas companies were working under a sliding-scale. The downward half of the sliding-scale was no real advantage to the consumer—in fact, it was the reverse. Of course, they knew that the man in the street frequently said: "Oh, yes; you will keep the price of gas down because if it goes too high you are going to be penalized." That was so up to a point; but the penalty carried with it a penalty on the consumer also. If the price of gas went high, and the Company wanted to raise additional capital, they had to pay more for it, and this involved an increase in the price of gas. On the other hand, so long as they kept the price at a particular rate, there was no advantage, either to the shareholder or to the employees, to go below that rate, because the 5 p.ct. dividend was fixed. But if they put in an inducement whereby the employees would benefit by a reduction in price below the basic rate, the shareholders would get a benefit. While this would be beneficial to the shareholders and employees, it would also be to the interests of the consumers. Even with the repeal of the downward half of the Company's present sliding-scale, without the present penalties, the gas undertaking had every inducement to sell cheap gas, because the Company—like other institutions that depended upon public support—wished to stand well with the consumers. The Company were not like manufacturers or shopkeepers, who could increase their dividends by increasing the price of the commodities. The Company were at present limited to a 5 p.ct. dividend; and so long as the dividend was secured, they naturally would not think of increasing the price of gas. The Company were faced with the very keen competition of electricity, which alone secured that the price of gas would not be unduly put up; and for this reason the penalties were not as effective as they were sometimes thought to be. The Chairman concluded by formally proposing that the Bill be approved.

Mr. B. G. WOOD seconded the motion.

Mr. HARRY FISHER remarked that he failed to see why there should be any opposition to the Bill. What was there to cavil at in a fixed 5 p.ct. dividend? He wondered if some of those who wrote to the Press in opposition limited their profits to 5 p.ct. He did not think so. Those present did not represent 1 p.ct. of the shareholders in the vast concern, which was proof of the confidence they had in the Chairman and Directors. The Company wanted to work harmoniously with the city. The Corporation had tried to knock them out two or three times. They wanted to buy up the concern at considerably less than any ordinary individual would have valued it at. The undertaking was such a creditable one that the Corporation seemed to be envious.

The CHAIRMAN mentioned that the price of gas in Sheffield was at present the third lowest of any gas undertaking. Comparing the basic price of 9d. per therm proposed in the Bill, he said the South Metropolitan Gas Company's Act, 1920, had a rate of 11d. per therm, with a dividend of 5 p.ct. on existing capital and 6 p.ct. on new capital. The Cardiff Company's basic price was 1s. 2·2d., with 5 p.ct. dividend on existing capital and 7 p.ct. on new capital; while at Swansea the basic price was 1s. 3·4d. per therm throughout the inner district, and 1s. 4d. per therm in the outside area, with rates of dividend similar to those of Cardiff. These rates had already been sanctioned by Parliament. The Sheffield Company were not asking for what Parliament had given to other undertakings. They were asking for a great deal less.

The motion was carried unanimously.

BIRMINGHAM GAS PRICES REDUCED.

Much discussion took place in the Birmingham City Council on Tuesday of last week with reference to proposed reductions in the price of gas; but eventually the Gas Committee's recommendation upon the matter was adopted by a substantial majority. The following, therefore, will be the prices charged for gas consumed after the December reading of the meters.

FOR LIGHTING, COOKING, AND DOMESTIC PURPOSES IN ONE PREMISES.

	Per 1000 C.Ft.
Up to and including 100,000 c.ft. per quarter	5 0
Quantity in excess of 100,000 c.ft. up to 500,000 c.ft. per quarter	4 11
Quantity in excess of 500,000 c.ft. up to 1,000,000 c.ft. per quarter	4 9
Quantity in excess of 1,000,000 c.ft. up to 2,000,000 c.ft. per quarter	4 8
Quantity in excess of 2,000,000 c.ft. up to 3,000,000 c.ft. per quarter	4 6
Quantity in excess of 3,000,000 c.ft. up to 4,000,000 c.ft. per quarter	4 3
Quantity in excess of 4,000,000 c.ft. per quarter	4 0

FOR MANUFACTURING AND MOTIVE POWER IN ONE PREMISES.

	Per 1000 C.Ft.
Up to and including 1,000,000 c.ft. per quarter.	4 6
Quantity in excess of 1,000,000 c.ft. up to 2,000,000 c.ft. per quarter	4 3
Quantity in excess of 2,000,000 c.ft. up to 3,000,000 c.ft. per quarter	4 0
Quantity in excess of 3,000,000 c.ft. up to 4,000,000 c.ft. per quarter	3 9
Quantity in excess of 4,000,000 c.ft. per quarter	3 6

The above prices are subject to 5 p.ct. discount for prompt payment.

Gas used for motive power and in manufacturing processes must be registered through separate meters.

The manufacturing rates apply to gas used for heating in connection with japanning and lacquering stoves, muffles, furnaces, stills and plating vats, blowpipes and soldering irons, ironing and pressing, and for other like purposes as may from time to time be approved by the Gas Committee subject to certain conditions.

GAS SUPPLIED THROUGH PREPAYMENT METERS.

	Installations in Use less than Ten Years.	Installations in Use Ten Years and Upwards.
	C.Ft. per Penny.	C.Ft. per Penny.
With meter only	16½	16½
With meter and Corporation fittings	15½	16½
With meter and Corporation cooker	15½	15⅔
With meter, Corporation cooker, and fittings	14⅔	15⅔

Alderman WILLIAMS, who proposed the adoption of the Committee's recommendations (in the absence of Alderman Lloyd, the Chairman of the Committee, owing to illness), said the Committee had gone into the figures very carefully, and they were satisfied they were able to make this reduction, which it was hoped would be the first of a series of reductions from quarter to quarter, if the price of coal and other materials continued to fall. The proposals would only bring back the scale to that which was in existence before the war. It was felt this should now be put into force again, because there were indications that the price of gas had been so prohibitive to the large manufacturer that not only consumption had been curtailed, but in some cases there had been either a threat or an actual withdrawal from use. They desired to keep alive the great activity of the gas undertaking as a commercial proposition; and they believed the suggestion in regard to large consumers was a proper business proposal. There had been a decrease in output between April and December, 1921, of 17⅓ p.ct. A decreasing income meant they had a smaller gross profit to meet their standing charges; and the reduction he had mentioned had made a difference of something like 5d. per 1000 c.ft. There were some thirteen consumers who at the present time were considering other methods. They had taken in the past 240,000,000 c.ft. of gas, and provided £16,000 towards standing charges. They did not want to lose these customers; but in order to keep them, they must make

some concession. It was believed that with the concession suggested they would retain them. This reduction in price would, it was hoped, stimulate an increased consumption of gas.

Alderman STEVENS proposed an amendment that the price of gas be reduced 6d. per 1000 c.ft. on the prices now charged. He regarded the proposals of the Committee as unfair and unbusinesslike; and they were a direct reversal of the policy set out in 1918. He looked upon the proposals as a tax on the householders, the small shopkeepers, the small manufacturers, the unemployed, and the underemployed, in order to pay for the gas of the large consumers. The total number of consumers was 187,038; and he estimated there were 132,000 small consumers, so that they were the backbone and stay of the Department. They used gas for cooking, heating, and lighting from early morning until people went to bed; and it was altogether wrong to give preferential treatment to large consumers. He also stated that the preparation of the new prices had been conducted in a very unbusinesslike manner; and neither the members of the Committee nor the officials could give them details as to the manner in which the figures were arrived at. He had asked for data with the cost of distribution to the various classes of customers; but he was told it would take months to get the figures out. They ought to be able, he contended, to get the figures out in a short time; and if they had not got them out, how had the Department arrived at the conclusion that this was the commercial value of the gas? If the Department could afford to sell gas at 3s. 6d. per 1000 c.ft. to the manufacturer, then the highest charge to the ordinary consumer should be 3s. 10d. This was giving the same margin for distribution as had been allowed during the last few years—4d. per 1000 c.ft. He did not think the question of greater output had much bearing, because if works were closed the demand for gas must come about in the natural way. To his mind the undertaking was not doing as well as it should. If mass production had anything to do with the price of gas, then the department in Birmingham ought to be able to supply the cheapest gas in the country, having regard to all the circumstances, because the undertaking was the largest outside London. He suggested they should adhere to the basis of charges which gave a margin of 4d. between the highest and the lowest. The cost of gas into the holder was 3s. 4½d. per 1000 c.ft.; and if they allowed the average price for distribution, the most they could sell gas for would be 4s. 0½d. If they did this, they would make money and help to pay off some of the terrible overdraft at the bank.

Alderman GREGORY, in seconding the amendment, associated himself in the main with the remarks of Alderman Stevens, except that of general condemnation of the management. He thought the general management was quite good; but he did not agree with the staggering disparity which was now proposed between the largest and the smallest consumers. Seven years ago the Council approved of the principle that the difference should be 4d.; and if the Council were to be consistent, they must admit that either the proportion in the last seven years was wrong or that which was now proposed. The difference of 1s. 6d. between the highest and the lowest was too large altogether; and he believed the lowest price was less than the gas could be manufactured for. There should be a difference between the classes of consumer; but this should be represented mainly, if not solely, by the difference in the cost of collection.

Alderman BOWER, supporting the amendment, said they were told that the gas into the holder cost 3s. 4½d. per 1000 c.ft., and the average cost of distribution was 1s. 4d.; and this gave them total figures which showed that it was proposed to supply gas in bulk to the manufacturing element in the city at something like 1s. 2½d. per 1000 c.ft. less than it cost the city to produce it. He wanted to direct the attention of the Council to the absolute injustice proposed towards the tradespeople, as compared with the manufacturers. For the purpose of comparison, he would take a consumer of 2,000,000 c.ft. for lighting purposes, &c. The old price charged to a tradesman consuming this quantity of gas was 5s. 3d. It was now proposed to charge him 4s. 8d., or a reduction of 7d. per 1000 c.ft.—in other words, a saving of £58 6s. 8d. Let them compare this with a manufacturer consuming the same quantity. In the past the price charged to him was 5s. 2d. It was now proposed to charge him 4s. 3d., or a reduction of 11d. per 1000 c.ft., making a saving of £91 13s. 8½d. They would see that the manufacturer was charged £33 7s. less than the tradesman for every 2,000,000 c.ft. of gas consumed. Alderman Bower then took another example, which showed how grotesque the whole proceeding became. He selected a tradesman and a manufacturer, each burning up to 4,000,000 c.ft., and arrived at the conclusion that, while the reduction to the former would lead to a saving of £233 6s. 8d., the saving to the latter would be £332 13s. 4d. In his judgment there was either gross miscalcuation or gross mismanagement.

Mr. THORNTON, supporting the Committee, urged that the quantity of gas they sold was going to govern the price the whole time. Three millions of capital was sunk in the gas undertaking; and the deadweight charges and the interest on capital were the same, whether they turned out 200,000,000 c.ft. or 1,000,000 c.ft. The figures put before them were the result of careful handling by skilled accountants. The scale laid before the Council was not as had been represented by the three previous speakers. It did not mean, for instance, that a tradesman who burned 1,000,000 c.ft. would be charged at the rate of 4s. 9d. for the whole lot. The scale was graduated so that the charge was 4s. 10d; and so it went on until the consumer of 4,000,000 c.ft. would be charged at an average rate of 4s. 6d. per 1000 c.ft., and not at 4s., as had been said by previous speakers. There was just the same graduation with respect to the manufacturer, who would pay an average of 4s. 1·5d. per 1000 c.ft. on a consumption of 4,000,000 c.ft. If they were not going to give the manufacturers the privileges they were entitled to, the department would not have the gas consumption that was necessary; and then gas would cost more. The figures submitted would prove his contentions, if members took the trouble to work them out, and see what they meant.

Mr. J. F. WHITE said he thought a case had been made out for a reduction to the small consumer, even to the extent of a further 6d. per 1000 c.ft.

Mr. GODRICH pleaded the case of the small domestic consumers, who, he said, were suffering hardship owing to the present price of gas.

Alderman WILLIAMS said Alderman Stevens had asked for figures which it was impossible to get, from one point of view. The Committee had to take the gas undertaking as a whole. If they did not get income, all their labour was in vain. They wanted the day load, and had to encourage those who could give this load, in order that the Department might square its accounts. This was really the gist of the whole of the Committee's proposals. Emphasis had been laid on the cost of gas being 3s. 4d. per 1000 c.ft. This figure of cost had been given to Alderman Stevens the day before; but it was a figure that had been ascertained up to the end of September, and included the high cost of coal consequent upon the strike. It did not necessarily mean this was the cost to-day. If between now and the next reading there was any possibility of making any other arrangement which the Committee could recommend as being equitable as between one consumer and another, he would endeavour to bring it before them for their consideration.

The amendment was defeated by 57 votes to 33.

Alderman WILLIAMS then moved the adoption of the proposals of the Committee relating to prepayment fittings. It was, he said, an agreed measure with those who were intimately interested that the Committee should make them that concession. It was in the nature of an experiment. They hoped it would not involve the undertaking in any loss; but, at the same time, there did not seem any profit in it.

Mr. WHITEHOUSE seconded. The arrangement, he declared, was the fairest and most equitable that could be made.

The resolution was carried, and the Committee's report approved.

BRENTFORD GAS COMPANY.

At the annual meeting next Wednesday, the Directors will report that the accounts for the year ended Dec. 31 show a profit on the revenue account of £164,875. After providing for the interim dividend to June 30, and fixed charges, there remains the sum of £62,148, which, with the balance brought forward, makes the amount of £97,377 available for dividends.

The Directors obtained from the Board of Trade, on March 31 last, an Order under section 1 of the Gas Regulation Act, 1920, substituting for the then existing standard price of 3s. 9d. per 1000 c.ft., a new standard price of 17·8d. per therm.

The Directors recommend, subject to income-tax, a dividend at the rate of 5 p.ct. per annum on the 5 p.ct. preference stock, at the rate of £5 12s. p.ct. per annum on the "A" consolidated stock, and at the rate of £5 10s. p.ct. per annum on the "B" consolidated stock.

The Directors have announced a reduction in the price of gas of 1d. per therm, which will take effect as from the reading of the meters for the present Christmas quarter.

The volume of gas sold shows a decrease of 1·39d. as compared with the corresponding output of the previous year. The number of consumers is 125,612, as against 124,093 last year.

The works at all stations are now rapidly approaching the state of efficiency at which they were maintained before the war.

Suggested Combination at Brecon.—The Brecon Chamber of of Trade have recently discussed the advisability of having the town lit by electricity, and have decided to support the local Gas Company in the movement.

Price of Gas at Dolgelly.—In reply to a request from the Dolgelly Urban Council for a reduction in the price of gas and for an improvement in the quality, the local Gas Company have replied that the quality would be inquired into. Regarding the reduction in price, this was quite impossible in the present circumstances, as the cost of coal had not come down since the Company had been compelled to advance the price of gas. This view was not held by the members generally; the Chairman (Mr. O. P. Hughes) adding that the reply was very unsatisfactory, and they must proceed to deal with the attitude taken up. It was eventually decided to reply to the effect that the Council must take what steps they thought best in the matter.

Roll of Honour at Wellington (N.Z.).—There was a large attendance of those connected with the Wellington (N.Z.) Gas Company one afternoon last November, in the Company's main office, where an Honours Board containing the names of employees who had served in the great war was unveiled by the Chairman (Dr. C. Prendergast Knight). Among those present were several Directors and Mr. J. H. Helliwell (Secretary). The Chairman pointed out that the roll of honour contained the names of 57 men, of whom 15 had been killed. Major Hardham, V.C., congratulated the Company on the excellent record of their employees during the war, and New Zealand on the fact that, for so small and young a country, nearly 17,000 of her sons had made the supreme sacrifice.

Joint Gas and Electricity Supply for Stone.—The Stone Gas and Electricity Company have intimated to the Stone Urban Council that they propose to exercise their powers under their Act of 1914, to put down an electrical plant, and have asked the Council if they desire to have the street lamps and public offices supplied. The Clerk said that he had received a letter from the Ministry of Transport stating that the last application of the Stone Gas Company was deferred until an inquiry had been held in connection with the proposals to form electricity supply areas in the North-West Midland District. The inquiry was to be held at Wolverhampton on Feb. 21. Mr. Oldham remarked that the Gas Company were getting in the thin end of the wedge. They would get their scheme started, and then claim compensation. His idea was to stop them from getting their scheme into operation until the inquiry had taken place. Mr. Nord said that the letter from the Ministry made it clear that the application of the Gas Company for an extension of their time was held in suspense until the inquiry had taken place; and for the Gas Company to jump in now and start their scheme, savoured of sharp tactics. It was decided to send representatives to the inquiry, and also to forward a copy of the Gas Company's letter to the Ministry of Transport.

GAS FATALITIES.

At an inquest held by the Liverpool Coroner, it was stated that an escape of gas from a broken street-main outside their residence in Jasper Street caused the death of Ellen Shields and Thomas Edward Harris, whose bodies (with that of a dog) were found in the kitchen. Mr. Robert Rogers, works foreman in the City Lighting Engineer's Department, gave evidence of having tested the gas-fittings in the house. He found them unsound to the extent of ½ c.ft. per hour. Mr. W. B. Payne, Superintendent of the Liverpool Gas Company, told the Coroner that, when the road was taken up after the fatality, a broken main was discovered 14 ft. from the house. The breakage was due to subsidence of the soil. The escape was a bad one; and the fracture was quite recent. Probably escaping gas passed through the soil to the house. Mr. Ernest Astbury, Assistant Engineer to the Company, stated that the gas supplied to this house was a mixture of coal gas and carburetted water gas. The carbon monoxide in this mixture would be about 12 p.ct. The smell of the gas would be most pungent. There was no doubt that the gas escaped from the street into the house. Mr. Fraser Harrison expressed the sympathy of the Gas Company with the relatives of the deceased couple.

An inquest was also opened in Liverpool, and adjourned, on the bodies of Robert Craig and his two children. The wife was kept alive by means of oxygen; and subsequently transfusion of blood was successfully made. A police official said he was quite convinced that the Craig family had been lying gassed from the previous Thursday until last Wednesday.

With reference to these fatalities, the following statement has been issued by the Liverpool Gas Company: Several fatalities due to the inhalation of town's gas having recently been reported from various parts of the country, it may allay the fears of householders generally, and help to a better understanding of the position, if a short statement is made with regard to the use of carburetted water gas in Liverpool. This gas, mixed with coal gas, has been sent out by the Liverpool Gas Company continuously for many years past; and during the whole period the fatalities due to accidental escape of gas have been comparatively few, considering the large population supplied. Reference has been made in the Press to the fact that water gas and carbon monoxide are odourless. It should be stated, however, that these gases are never, under any circumstances, sent out by the Liverpool Gas Company without admixture with coal gas or oil gas, both of which have a strong and pungent odour, as readily detected as that of unmixed coal gas. It has also been stated that during and since the war the use of water gas has been greatly extended. This is not so in regard to Liverpool, except during emergency periods, when larger proportions were sent out by order of the Government. The advantages of carburetted water gas when compared with coal gas include higher flame temperature and intenser light in the incandescent mantle, less consumption of oxygen for combustion, greater freedom from sulphur compounds, and cheaper cost of production. Experience in Liverpool has shown that the presence of a moderate proportion of carburetted water gas in the town supply does not increase the danger caused by inhalation. Dr. J. S. Haldane, in his evidence before the Departmental Committee on Carbon Monoxide in February last year, suggested a definite maximum for the percentage of carbon monoxide; 20 p.ct. being, in his opinion, a reasonable figure.

A verdict of accidental death was returned at an inquest at Cardiff on the bodies of Mr. T. J. Thomas, of Bargoed, and of Miss Gertrude Daniels, of Bangor, who were found dead in Mr. Thomas's house at Cardiff. Both bodies were in the bathroom, which was full of gas. Dr. W. J. Thomas, of London, said his brother was happy and contented in his relationship with Miss Daniels, whom he had known for eight or nine years. Clerks employed by Mr. Thomas said that, in consequence of his absence from the office for over a week, they went to Cardiff to make inquiries, and obtained the assistance of the police. On going to Mr. Thomas's house, they found the lights on in the front bedroom and in the bathroom, and Mr. Thomas lying on his back near the bath. Miss Daniels was also lying dead behind the bathroom door. The gas-jet used for the geyser attached to the bath was turned on; and the room was full of gas. The police witnesses stated that the gas-tap was defective, and could have been turned merely by a towel falling on it.

A gas poisoning affair in a flat at Paddington, in which Harry Grosmont, of Leeds, and Mary Dale lost their lives, was investigated by the Paddington Coroner. It was stated that the girl had lived at the flat for about three weeks. The bodies of the couple were discovered by the landlady on the evening of Wednesday last—the girl in bed, and the man partly dressed lying across the bed. From a stove in the room gas had apparently escaped. How the gas came to be turned on the evidence failed to show; and the Jury found that death was due to coal-gas poisoning, adding that there was not sufficient evidence to show how the gas was turned on. A gas inspector said the stove was in perfect order, and could not have been turned on by accident. It was possible for the meter supply to have run out, and later to have been renewed by the insertion of a coin.

The Halifax Coroner, with a Jury, inquired into the death of Mary Crowther. On Jan. 17 she and her daughter were found unconscious in bed, with a strong smell of gas in the house. The daughter also died; and the inquest in her case was opened, and adjourned to Feb. 15. Mrs. Mary Eliza Denton, a married daughter, said that when she called to see her mother at 9.30 a.m. on Jan. 17 the door was locked, and the blinds drawn. As neighbours had been complaining of sickness that morning, due to some escape of gas, she became alarmed. Afterwards both women were found unconscious in bed. All the gas-taps were turned off. An inspector of gas-mains said that when the main in front of the premises was bared, he found a crack in it; and gas was going along a service-pipe track into a gully, which was also cracked. This would allow the gas to escape into the house. The crack in the main was probably caused by the frost. A verdict was returned that "Death was due to gas poisoning; the gas having escaped from a cracked main, and percolated into the house."

"There is no doubt that climatic conditions may affect the gas-fittings," said Mr. Alex. A. Johnston, the Engineer and Manager of the Brentford Gas Company, to a "Daily Express" representative "Houses and districts where there is a clay soil have been disturbed; and this might have some effect on the pipes. There is no reason for the public to feel alarmed, as the total number of gas escapes is comparatively small."

An official of the National Gas Council is reported in the same paper as saying: "There is no ground for fearing that the coincidence of the accidents recently reported is any indication of increased danger. A great deal of evidence was laid before the Committee appointed by the Government to inquire into the question of carbon monoxide—to which so much reference has recently been made—and this Committee unanimously decided that no cause existed for any restriction on the methods of gas making in this respect. The gas industry are obviously more keenly alive than any one else to the grave consequences of doing anything to increase the danger of the gas they supply for their consumers; and the public can be entirely reassured on this question."

Under the heading "Gas Dangers Exaggerated," the "Daily Chronicle" says: "There is no cause for alarm. The proportion of carbon monoxide in gas supplied for domestic purposes is to-day less than during the war and the coal strike." In these words, an official of the National Gas Council, speaking to a representative of the "Daily Chronicle," referred to the disquieting suggestions which have arisen through the large number of deaths from gas poisoning which have occurred lately.

"While the coal strike was on," he said, "one town of considerable size was supplied with water gas only; and there were no casualties. Naturally the gas companies would not supply a gas that was dangerous to the public, as much in their own as the latter's interest. It is as false to base deductions upon the crop of fatalities," he pointed out, "as it would be to represent a day's rainfall as that for the whole year. Gas is being used to an increasing degree that is remarkable; and the fittings furnished minimize the danger. How slight this is may be judged from the fact that the fatalities are about one in 2,000,000 users." To produce an economic gas, water gas is mixed with coal gas, some companies using a greater or less proportion than others. The result is that for the whole country the percentage of carbon monoxide—which possesses poisonous properties—in domestic gas is roughly 16. The proportion of carbon monoxide in the two gases is—

Water gas	42 p.ct.
Ditto, carburetted with oil	30 to 25 ,,
Coal gas	7 ,,

Last year a Board of Trade Committee, presided over by Sir William Pearce, investigated the subject, and recommended that no limit be imposed on the proportion of carbon monoxide that may be supplied in gas used for domestic purposes. The danger of increased death rate is, in any case, of small dimensions, the Committee declared; and against this must be set the certain improvement in the public health by the reduction of smoke and fog arising from increased use of gas.

The following is taken from the "Manchester Daily Dispatch": "When the suicides have been eliminated it will be found," said a Manchester authority to the "Daily Dispatch," "that the casualties from gas-fires are less than those from coal-fires. Just think of the number of terrible burning fatalities which have occurred since the cold snap began. In Manchester alone there were three in one week. Most gas poisoning cases can be attributed to some defect in the fittings, or to sheer carelessness by the householder. The Manchester Corporation Gas Department inspectors regularly overhaul gas-fires to see that they are intact. They find that users meddle with the screws—and generally consume in consequence more gas than they need. Often the fire is moved so that the flue does not carry off spent gases. Sometimes the flue has been stuffed with paper or cloths to keep out the draughts! Very few mishaps occur with cookers. Generally the gas-light fittings are defective. Modern gas-brackets are of such poor material that they soon wear out. The property repairer generally uses the cheapest he can lay his hands on; and they leak in a few years. When one can hear the meter ticking now and again in broad daylight, it is a sure indication of a leak. Many taps will turn completely round, so that when the light has been extinguished it is apt to be overturned. Then the leak, if the windows and doors are all shut, and possibly also the register in the chimney, will quickly fill the room. Then there are leakages from the piping. People drive nails into the walls, and hit the pipe. Subsidence of houses such as is constantly going on is a great source of trouble. The pipes stretch, a slit appears, and the gas works through the plaster. No definfte leak is apparent. The plumber should be consulted."

Owing to the numerous reports received by the "Daily Express" with regard to the quality of domestic gas and proportions of carbon monoxide that it contains, arrangements have been made with an expert gas analyst, who holds a public position in London, to analyze a sample of domestic gas.

Edinburgh Reduction.—A considerable reduction in the price of gas in Edinburgh is promised. A sub-committee of the Gas Committee of the Town Council resolved on the 20th ult. to recommend that the price be reduced by 8d. per 1000 c.ft., making the charge for the quarter now current 5s. per 1000 c.ft.

Fatality at Sheffield.—A verdict of "Accidental death," with no blame attached to anyone, was returned by a Coroner's Jury who inquired into a double fatality at the Neepsend works of the Sheffield Gas Company. The two men who lost their lives (Edwin Smith and Percy Parker) were employed by the Woodall-Duckham Company, who are putting down vertical retorts at the works; and while some girders were being raised by a crane, the sling broke, and the girders fell on the men, who were working on some scaffolding below. Mr. Cecil M. Gorwyn, Engineer to the Woodall-Duckham Company, said the sling was of hemp, 4½ in. in circumference. He had had it in his possession for six weeks, and had inspected it a week earlier. The cause of the sling breaking, in his opinion, was the hard frost, and then the sudden thaw. A chain sling would not have been better, because a much stronger loop was obtained with a hemp sling. The foreman said the jury were strongly of opinion that these slings should be frequently renewed.

THE DANGER OF UNVENTILATED HEATING APPARATUS.

Improper Fixing to a Gas Bracket.

An inquest was held at Manchester on the 20th ult. into the cause of the deaths at Clayton on Jan. 9 of Frederick William Iveson, his wife, and their son (aged 6). They were found dead in a bedroom of their house. A verdict of "accidental death" was returned; the evidence showing that all three had died of carbon monoxide poisoning. The room in which the bodies were found had in it a "Helix" heater, which had been attached to a gas-bracket by the tenant himself. Evidence was given to the effect that this heater was in bad repair and badly fitted; while the fireplace was stopped-up with cardboard—presumably to avoid draughts.

Dr. *Sidebotham*, Acting Director of the Public Health Laboratory, Manchester, spoke of receiving from Dr. Maclure, the Deputy Medical Officer for the city, the internal organs of the three victims, and also the heater produced. He found all the organs healthy; and he made blood tests. In the blood he discovered sufficient carbon monoxide to cause death. Replying to the Coroner, he said the heater was supposed to burn at the top. What it actually did was to burn for some time at the top, and then flash-back to the bottom. All the time gas was either escaping from the top or from the bottom. The heater was in bad repair, and had evidently been put on an old incandescent burner. As it fitted badly there was always an escape of gas. Carbon monoxide was generated.

The CORONER: Supposing this heater had been properly fitted, would you consider it a dangerous thing to have in a bedroom?

Witness: If properly fitted it would be all right.

Dr. *Ward*, who made the post-mortem examination, agreed with Dr. Sidebotham that death was due to carbon monoxide poisoning.

Dr. *Maclure* stated that the heater was a most dangerous thing, unless there was some ventilation in the room.

The CORONER characterized the tragedy as a very sad one. He was glad the matter had now been cleared up. There could be no two opinions as to what had happened.

NITRATE OF SODA LAST YEAR.

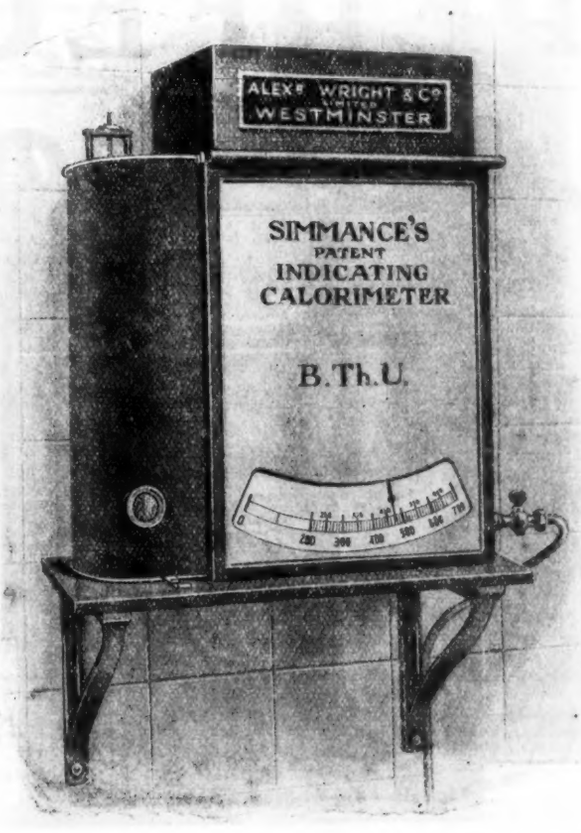
Reviewing the events during 1921 as affecting the nitrate of soda industry, the "Chemical Trade Journal" says that, except for the continued absence of Germany as a leading factor, the nitrate industry appeared a twelvemonth ago to be regaining a normal position; but the past year has, unfortunately, been one of great disappointment to all connected with nitrate. Producers were unable to dispose of the vast accumulation of stocks tied-up by the maintenance of prohibitive prices. European and other holders, unwilling to cut their losses and meet the market, were likewise left in the lurch; and consumers, deterred by the precipitous depreciation of all agricultural produce pursued a strictly conservative manurial policy.

From 191,000 tons in January, the output of nitrate in Chili gradually sank to 71,000 tons in November. The average monthly production in 1921 was 108,000 tons, compared with 208,000 tons in 1920, and 228,000 tons in 1913. The outstanding feature in shipments was the sensational drop in the American total, approaching a million tons; while many large cargoes originally destined for the United States were subsequently diverted to Europe. In both cases the shrinkage in exports was most noticeable in the last quarter of the year (usually the most prolific); those to other parts, on the contrary, showing some elasticity during that period. The United Kingdom took no more than 71,000 tons in the past twelve months, including the large proportion used for chemical purposes. The British farmer, liberally supplied with cheap sulphate of ammonia, paid little attention to the Chilian fertilizer, the sale of which in this country dealers have, moreover, no inducement to push, when their customers are able to buy small lots on equal terms.

The falling-off in the Continental consumption is mainly attributed to the severe drought last spring; but, as a matter of fact, high prices, comparing unfavourably with those of rival nitrogenous manures, were the real reason. Nitrate of soda was conspicuously lower than in 1920, but still too dear in view of the agricultural depression, and notably the unfavourable offers for resale made to growers by the French sugar factories. The serious decline in the Egyptian demand is due to the depreciation of cotton, which is likewise partly responsible for the slump in the United States deliveries. These latter are, however, admittedly mere estimates (as in the case of other countries), which, judging from the small quantity of nitrate shipped last year, do not err on the side of moderation. The American direct agricultural demand for nitrate has always been comparatively small; the bulk of imports going to the fertilizer and chemical factories, while the enormous requirements for the manufacture of explosives have, of course, come to an end. A recent sale by auction of surplus stocks by the United States Government has had a chastening effect on the nitrate market in the States. Notwithstanding the drastic curtailment of production and shipments in the past year, the nitrate industry and trade have fallen into a state of paralysis, resulting in a vast accumulation of stocks both in Chili and in Europe.

Cheap Gas at Coatbridge.—The Directors of the Coatbridge Gas Company, at a meeting held last Thursday, had before them the working results for the six months ended Dec. 31 last. In view of the satisfactory nature of these results, it was decided to reduce the price of gas by 1·2d. per therm as from Jan. 1, 1922, making the rate for gas supplied by ordinary meters 9·6d. per therm. This reduction is equivalent to 5·4d. per 1000 c.ft. It was also resolved that interim dividends be paid on the original shares of 11½ p.ct. per annum and on new shares of 7⅞ p.ct. per annum, which rates are in accordance with the sliding-scale fixed under the Gas Regulation Act, 1920.

CALORIFIC POWER AT A GLANCE.



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CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *Jan.* 30.

The increase in inquiry for pitch for export is sustained. It is reported that deliveries of German pitch are again delayed, and the result is that some buyers needing supplies are covering their requirements by purchasing English pitch. It is understood that makers' prices are 62s. 6d. to 65s. net per ton f.o.b. their works. Creosote is quoted at about 6½d. net per gallon in bulk for large quantities. Benzole, toluole, and solvent naphtha are unchanged.

Tar Products in the Provinces.

Jan. 30

Markets in tar products are quietly steady, with the possible exception of creosote oil, which appears to be decidedly dull; there being little or no inquiry for this at the moment. Business has again been reported at 5d. per gallon for salty and 5½d. for liquid. Pitch is steady, with a slightly improved demand; and sellers are inclined to ask higher prices. Crude benzole continues dull; and there is little business doing. Solvent naphtha is steady with an improved demand in the north. Carbolic acid is firmer; and the inquiry from the Continent continues. A little business is reported to have been done in crude naphthalene, but at a very low price. Anthracene remains unsaleable.

The average values for gas-works products during last week were: Gas-works coal tar, 35s. to 40s. Pitch, East Coast, 56s. to 58s. f.a.s.; and 60s. to 62s. 6d. f.o.b. West Coast—Manchester, 54s. to 56s.; Liverpool, 54s. to 56s.; Clyde, 57s. 6d. to 60s. Benzole 90 p.ct. North, 2s. 2d. to 2s. 3d.; crude 65 p.ct. at 120° C., 1s. 8d. to 1s. 9d. naked at makers' works; 50-90 p.ct., naked, North, 2s. 2d. to 2s. 3d. Toluole, naked, North, 2s. 8d. to 2s. 10d. nominal. Coal tar crude naphtha in bulk, North, 10d. to 11d. Solvent naphtha, naked, North, 2s. 2½d. to 2s. 5½d. Heavy naphtha, North, 2s. 1½d. to 2s. 5½d. Creosote, in bulk, North, liquid, 5⅜d. to 5⅝d.; salty, 4⅞d. to 5d. Scotland, 4½d. to 5d. Heavy oils, in bulk, North, 6¾d. to 6⅞d. Carbolic acid, 60 p.ct., 1s. 10d. Naphthalene, £13 to £16; salts, £5 to £5 10s., bags included. Anthracene, "A" quality, 5d. to 6d. per minimum 40 p.ct.; "B" unsaleable.

FROM A MARKET CORRESPONDENT.

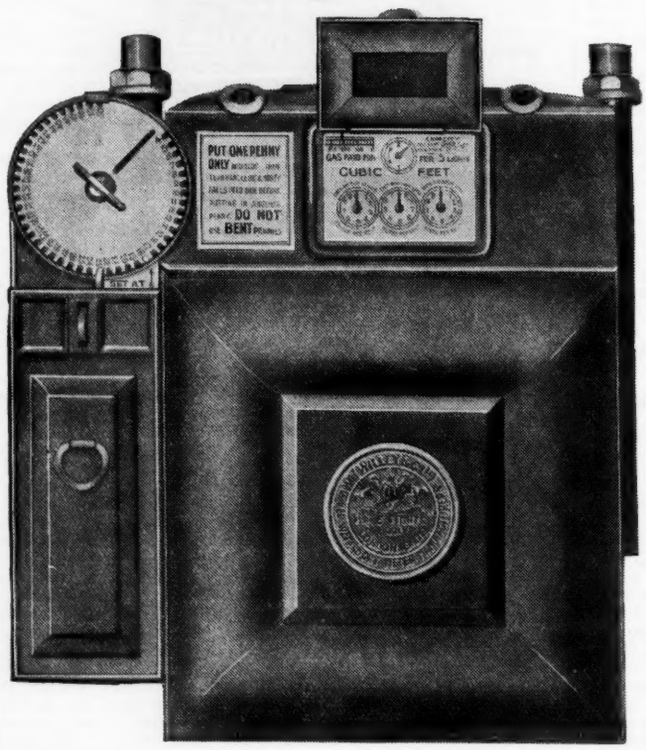
The market for tar products is still very dull, with the one exception that there is a better feeling in pitch. Quotations for this material vary a good deal; some prices being reported at 52s. 6d., and in other directions sellers maintain that they cannot take less than 70s. Some of the South Wales consumers are making inquiries in the North; but it is difficult to see how they can afford to take pitch such a distance in view of the heavy railway rates now prevalent. There is a good demand for solvent naphtha at 2s. 7d. to 2s. 8d., although for delivery by tank-wagon something less might be taken, and there is not so much disposition to make "bear" sales as there was a little while ago. There is every prospect of a larger supply, as some coke-ovens are being started-up. Naphthalenes are not much altered; crude being in fair demand for the firelighter trade, but without much inquiry for refined. The former remains at from £5 to £8 per ton, and refined £15 to £17. Carbolic acid is a dead market, with quotations nominally 1s. 6d. per gallon for crude and 4½d. per lb. for crystal. Cresylic acid is reported easier at 2s. 2d. to 2s. 3d., and creosote is also weaker and worth 4½d. to 5d. per gallon on rail. Benzole 90's is selling at 2s. 5d. The demand for pure benzole has fallen; the quotation now being 3s. per gallon on rail. Business in intermediates during the past ten days has been quiet, although the export market has shown many signs of interest. Aniline oil and salt continue to come into consumption steadily at 1s. 1d. and 1s. 2d. per lb. respectively. Beta naphthol is steady at 2s. per lb. Salicylic acid is 1s. per lb. for technical grade, and resorcin 6s. per lb. for technical grade.

Sulphate of Ammonia.

There is very little change in the position of this material. So far, the buying movement, which was anticipated at this time, has not come forward. It is difficult to understand why farmers are delaying placing their orders, even though the time of application is still six weeks or so ahead. It may be that they do not like parting with their money or purchasing while prices of farm produce generally are so low, or they may intend to economize very strictly in their use of fertilizers this season. The two latter policies at any rate are not likely to be profitable ones, and the first reason also is hardly feasible. There has been a fair amount of export business at advancing figures. Prices for February delivery for home consumption are £16 13s. for neutral quality and £16 10s. for ordinary quality. For export, £17 10s. is the latest value; but this trade is threatened by the increasing American competition. News from America suggests that that country is endeavouring to develop its trade with Spain, Italy, Japan, and Java, which have in the past imported practically all their requirements from the United Kingdom.

A Further Reduction Promised at Newcastle.—The Directors of the Newcastle and Gateshead Gas Company have resolved to recommend, subject to audit, the payment of final dividends for the year ended Dec. 31 of 2 p.ct. upon the preference stock, making 4 p.ct. for the year, and of 2¼ p.ct. upon the ordinary stock, making 3¾ p.ct. for the year. They are pleased to be able to state that a further reduction in the price of gas will be made from the March reading of the meters. The amount of the reduction has, however, not yet been settled.

PERFECTION.



All Mechanism and Coin Insertion Slot in Front.

Range 4 to 50 c.ft. per 1d., or *pro rata* for other Coin.

Valve Positively Opens at 4 c.ft.

Price Changed *in situ* by the most rapid method devised.

Cash Box holds up to 80s. in Coppers.

The Mechanism is of Extra Strength on the Interchangeable Principle of Fine Limits of Accuracy.

Try a Sample; we are confident of your approval.

NEW STANDARD PATTERNS SUPPLIED *EX* STOCK.

WILLEY & Co., Ltd.

Chief Offices and Works: St. THOMAS, EXETER.
London Offices and Works:
89-95, HERTFORD ROAD, KINGSLAND, N. 1.
Manchester Meter Works:
SAVILLE STREET, OXFORD ROAD.
Leicester Meter Works: 5, OXENDON STREET.

Agents for Scotland: D. M. NELSON & Co.,
20, West Campbell Street, Glasgow.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for Jan. 25.]

Nos. 1296 to 1897.

ADNITT, W. D.—"Gas injectors." No. 1307.
BROADHEAD, R. W.—"Bearings for supporting gasholders." No. 1296.
BROADHEAD, R. W.—"Means for applying lubricant to guide-rails, &c., of gasholders." No. 1297.
BURT, BOULTON, AND HAYWOOD, LTD.—"Treatment of pitch." No. 1369.
BURT, BOULTON, AND HAYWOOD, LTD.—"Manufacture of pitch containing little free carbon." No. 1370.
BURT, BOULTON, AND HAYWOOD, LTD.—"Manufacture of bituminous products from coal tar." No. 1371.
CARMICHAEL & CO., LTD., J. F.—"Apparatus for the manufacture of sulphuric acid." No. 1388.
CHINA, F. J. E.—See Burt, Boulton, and Haywood, Ltd. Nos. 1369, 1370, 1371.
CUMBERLAND COAL, POWER, AND CHEMICALS, LTD.—"Manufacture of hydrogen or gases rich in hydrogen." No. 1691.
CUTLER-HAMMER MANUFACTURING COMPANY.—"Calorimeters." No. 1766.
DAVIS, H.—"Gas-burners using incandescent mantles." No. 1713.
DEMPSTER & SONS, LTD., R.—"Furnaces for heating gas-retorts." No. 1846.
ERRINGTON, W. H.—"Portable gas-fires." No. 1855.
FABRY, R. F. F.—"Bye-product coke-ovens." No. 1634.
FERGUSSON, H.—See Burt, Boulton, and Haywood, Ltd. Nos. 1369, 1370, 1371.
GOULD, A. J.—"Devices for reducing or adjusting gas pressures." No. 1466.
GUILLAUME, F.—See Carmichael & Co., J. F. No. 1388.
HARPER, F. D.—"Pipe connections for retorts, coke-ovens, &c." No. 1646.
IGRANIC ELECTRIC COMPANY, LTD.—See Cutler-Hammer Manufacturing Company. No. 1766.
JAQUES, A.—See Cumberland Coal, Power, & Chemicals, Ltd. No. 1691.
MILES, F. D.—See Burt, Boulton, and Haywood, Ltd. Nos. 1370, 1371.
ROBINSON, F.—See Gould, A. J. No. 1466.
SCOTTISH DYES, LTD.—"Method of producing anthraquinone-sulphonic acids." No. 1575.
SIMMONS, W. H.—"Automatic gas-valve for regulating temperature of incubators." No. 1731.
THOMAS, J.—See Scottish Dyes, Ltd. No. 1575.
TOOGOOD, H. J.—See R. Dempster & Sons, Ltd. No. 1846.
TULLY, C. B.—See Cumberland Coal, Power, & Chemicals, Ltd. No. 1691.
TWYNAM, T.—"Recovery of fixed atmospheric nitrogen." No. 1631
WARR, J. H.—See Burt, Boulton, and Haywood, Ltd. No. 1371.
WEIL, C. R.—See Gould, A. J. No. 1466.
WEST, J. H.—See Cumberland Coal, Power, & Chemicals, Ltd. No. 1691.
YOUNG, W. H.—"Regeneration of retort-settings and furnaces." No. 1607.

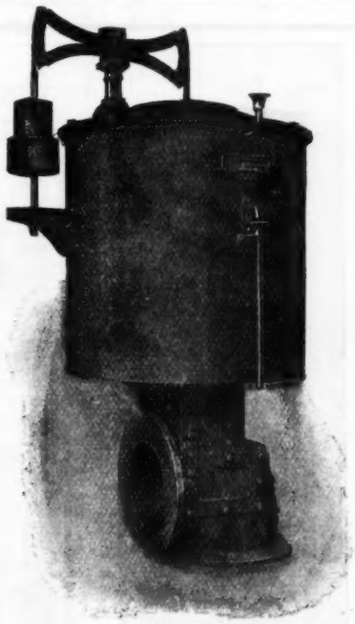
Metropolitan Gas Company of Melbourne.—Messrs. John Terry & Co., of No. 7, Great Winchester Street, E.C., have received a cablegram from the Metropolitan Gas Company of Melbourne (for whom they act as Agents) informing them that the profits for the six months to Dec. 31 last were £109,159. A dividend of 6s. 6d. per share has been declared, an amount of £32,000 has been transferred to reserve account, and a sum of £35,656 has been carried forward. It was expected that dividends would be paid in Melbourne on the 1st inst., and that those to absentee shareholders would be posted by an early mail.

Gas Installation and Housing Schemes.—The Housing Committee of the Hammersmith Borough Council have reported that, as a result of negotiations with the Ministry of Health, the Ministry had agreed, on the understanding that the contribution to the repairs fund for the houses now built, or included under contracts for construction, was limited to 13½ p.ct. of the estimated gross rents, instead of 15 p.ct. referred to in the Housing (Assisted Schemes) Regulations, 1919, to allow the dual service of gas and electricity to rank for subsidy under the Assisted Housing Scheme. This settlement was subject to the Council enforcing their statutory powers for the supply of gas where such were applicable, and to the payment of £10 per house to the Gas Company being made only in respect of houses where such powers were not enforceable. The Ministry had further agreed that the limitation of the allowance for repairs and maintenance of 13½ p.ct. of the gross estimated rents should apply only to houses in respect of which the £10 contribution to the Gas Company was necessary. In regard to electricity, the cost of pendants, lamps, and shades would not rank for financial assistance, except in eight houses already approved by the Ministry, and in which fittings were provided prior to the Ministry intimating that these would not rank for subsidy. The cost of these fittings (with the exception indicated) would be borne by the tenants and purchasers. It has been ascertained that 67 of the houses on the estate were within the statutory distance of the Gas Company's mains, and that the number of houses on which the limitation of the allowance was to be placed was 484. The Committee were of opinion that the settlement proposed was a reasonable one, and had agreed thereto. At the same time they had also given instructions for the return of the amounts paid by occupiers and prospective occupiers to the Council for the installation of a gas service.

BRADDOCK'S
RETORT-HOUSE
GOVERNORS
HAVE PROVED TO BE
SECOND TO NONE.

Many repeat orders have been received.

Braddock's New Patent Retort-House Governor is a further improvement and is especially desirable for use with Vertical Retorts.



No. 310.
Braddock's New Patent Enclosed Retort-House Governor. Latest Type.

Further Particulars upon Application.

J. & J. BRADDOCK (BRANCH OF METERS LIMITED), Globe Meter Works, OLDHAM.
Telegrams: "BRADDOCK, OLDHAM." National Telephone No. 815.
AND 45 & 47, WESTMINSTER BRIDGE ROAD, LONDON, S.E. 1.
Telegrams "METRIQUE, LAMB LONDON." Telephone No. 2412 HOP.

Sulphate of Ammonia Position.

What is regarded by the "Chemical Trade Journal" as an encouraging feature when looking back over the past year is the increase which occurred in the exportation of sulphate of ammonia. Though considerably below the export total of 323,054 tons, valued at £4,390,547, for 1913, which is the last complete pre-war year, the steady rise of from 15 to 20 p.ct. recorded in 1920 and 1921, gives cause for satisfaction. The actual figures are: For 1919, 92,866 tons, valued at £2,231,761; for 1920, 109,620 tons, valued at £3,658,625; and for 1921, 128,433 tons, valued at £2,659,140. What makes this state of affairs more gratifying, is that the progress has been made in the face of keen competition, both from the now firmly established United States industry and the menace of atmospheric nitrogen. Referring to the home policy, our contemporary says: The Sulphate of Ammonia Federation, who represent over 90 p.ct. of the United Kingdom production, held their first annual meeting in November, and at that meeting Mr. D. Milne Watson (the Chairman) spoke of the extensive propaganda work and the admirable selling organization of the Federation. The policy of this body is to get into direct touch with the ultimate consumer, to study him, and then supply his needs. The production of acid-free sulphate of good quality is one of the definite aims of the Federation, we believe; and this end is itself a good sign of its healthiness. There is no doubt that such a combine will be able to aid agriculture generally; for bye-product sulphate of ammonia is only one of the many forms of nitrogen available for use as a fertilizer. Prices will be regulated by competition rather than international conferences; but the latter will doubtless serve their purpose in endeavouring to increase the world consumption.

South Suburban Scientific Society.—At the first meeting of the South Suburban Scientific Society, on the 26th ult., the Chairman (Mr. A. V. Hendrickson) devoted the larger part of his Inaugural Address to discussing the natural history of coal. Numerous diagrams, specimens, and micro-slides were shown in illustration of the points raised. At its close, Mr. Hendrickson was very cordially thanked.

Camberwell Infirmary and Gas-Irons.—The Superintendent Engineer has presented a report to the Camberwell Board of Guardians in connection with the installation of high-pressure gas for hand and machine ironing. The cost of coke, at 43s. per ton, used in the infirmary laundry for heating the irons and airing the clothes, was about £57 per year. The makers state, he estimates, that the cost of gas used by their plants, with six gas-irons, would be about £23 a year. The laundress would welcome the use of gas-irons, but was doubtful about the drying rooms being sufficiently hot when heated by the steam-pipes, which would be fitted if the coke-stoves were abolished. He estimated that the cost of the gas plant, irons, &c., and fitting steam-pipes in the airing rooms, would be about £55. The Infirmary Committee reported that it would not only be more economical than the present system, but would expedite the work.

Short-Circuit Causes a Fatal Fire.—The State Theatre at Dessau was burnt-out last Wednesday afternoon; and Fraulein Herking, an opera singer, unhappily lost her life. During a rehearsal, some scenery caught fire, as the result, says "The Times" correspondent, of a short circuit; and the whole building was soon in flames, with which the fire brigade were unable to cope. A rare collection of theatrical costumes and properties and the entire repertory library were destroyed.

Tottenham Gas Company's Dividend.—The Directors of the Tottenham District Light, Heat, and Power Company recommend the payment of the full statutory dividends in respect of the half year ended Dec. 31, 1921—viz., at the rate of 5 p.ct. per annum on the preference stock, 7¼ p.ct. per annum on the "A" stock, and 5¾ p.ct. per annum on the "B" stock—all less income-tax. The dividends for the corresponding half-year were at the rate of 5 p.ct. per annum on the preference stock, 3¾ p.ct. on the "A" stock, and £2 12s. 6d. p.ct. on the "B" stock—all less income-tax.

Among new companies registered is the Hawick Gas and Coke Company, Ltd., with a capital of £36,000 in £5 shares.

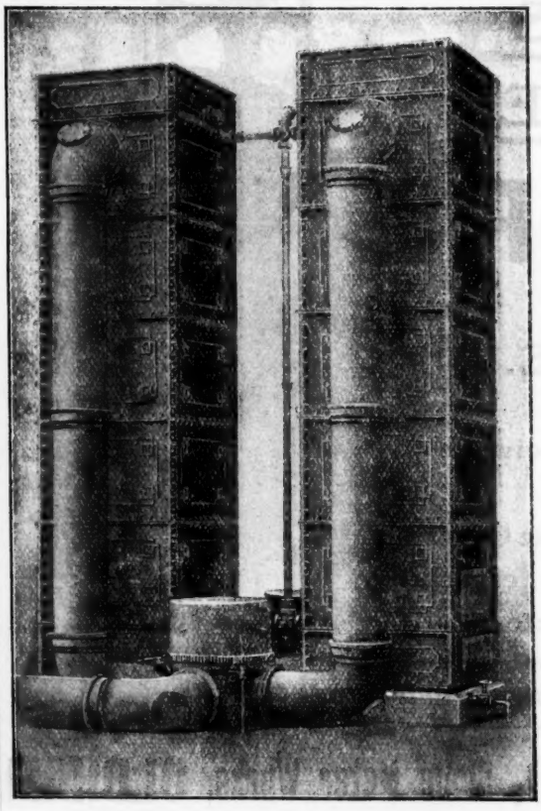
The Directors of the Swansea Gas Company announce that when the result of the past year's working is available it is proposed to reduce the price of gas.

The Lockerbie Gas-Works are to be extended, and ground has been purchased for the purpose. There has been an increase in the output of gas. The amount manufactured in December was 1,729,800 c.ft., as compared with 1,623,300 c.ft. in the corresponding month of the previous year.

During a recent evening, darkness descended suddenly on Fenchurch Street Station, at 9.30, when the electric current from the Stratford generating station failed. The main platform was crowded with people waiting for the Southend train. The electric light was restored at 11 p.m.

To a letter received by the Briton Ferry Urban District Council last Thursday, from the Neath and Aberavon Master Bakers' Association, requesting a reduction in the price of coke and gas, the Council decided to reply that the price of coke had already been reduced 10s. per ton, and that the charge for gas was lower than that of any other local authority of a similar size.

Mr. Charles Wood, the Bradford Corporation Gas Engineer and General Manager, is President of the Bradford Amateur Wireless Society, which, on Friday and Saturday last, held its first exhibition of wireless apparatus, at the Technical College. Wireless telephone messages, both in speaking and song, were received from certain amateurs who are fortunate enough to possess transmitting licences as well as licences for listening-in; and at certain periods during the two days, music was received by wireless telephone from the Eiffel Tower, Paris. This is the first exhibition out of London at which this has been secured.



"BEARSCOT" TUBING IN WATER CONDENSERS EXTENDS UPWARDS OF 150 MILES.

WATER-COOLED CONDENSERS

AS FITTED WITH THE **"BEARSCOT"** SAFE JOINT TUBE.

With our Central Port Fourway Valve the Condensers may be Reversed or Bye-passed as Required.

PARTICULARS WILL BE SUPPLIED UPON APPLICATION TO—

R. & J. DEMPSTER, LD.

Telegrams: "Scrubber Manchester"

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STOCK MARKET REPORT.

THE week just closed on the Stock Exchange opened favourably for several markets, especially the gilt-edged. But it would not last, neither home nor foreign affairs being calculated to infuse cheerfulness; and the closure was weak. Home Government issues were irregular; Funding and Victory being up, War Loan unmoved, and Consols down. Their Friday figures were: Consols 52-52¼, War Loan 93¼-93⅝, Funding 79⅛-80⅛, Victory 83¾-84¼. Home Rails, after a bad start, were improved by the dividend outlook.

Business in the Gas Market was a little more active than in the week before, thanks in great measure to the large demand for issues of the largest London companies. The steady rise in prices generally ruling of late continued. Gas Light preference rose 2, and South Metropolitan 1½. The Suburban and Provincial group showed increased strength; stock being firmly held, which naturally kept business quiet. Brentford "A" and "B" rose 2 each, and British 1; while others commanded higher prices, though quotations were left standing. Ilfords were not affected by the notification of approaching amalgamation with Gas Light and Coke. In continentals, Europeans rose *ex div.*; but Imperial fell 5. Primitivas were quiet and unchanged.

Bargains done for cash during the week were as follows: On Monday, Brentford "A" 82, 83, British 25⅞, Commercial 3½ p.ct. 61, Gas Light ordinary 70, 70⅛, 70¼, 70⅜, 70½, 70⅝, ditto maximum 54, 54⅛, ditto preference 66½, 67⅛, ditto debenture 53, 53¼, 54, Imperial Continental 130, 132, 133, and "exceptional" 100, Primitiva 138. 9d., 148. 9d., South Metropolitan 76⅛, 77⅛, 78, ditto debenture 52⅛, 52⅜, Barnet 4 p.ct. debenture 60, British (Norwich) 3 p.ct. debenture 39½, 40, ditto (Hull) 3½ p.ct. debenture 46⅛, 47, Cardiff 5 p.ct. max. 74½, ditto "D" 67½, 68½. On Tuesday, European £8 9s., Gas Light ordinary 70¼, 70⅛, 70⅜, ditto preference 66⅜, 67, 67½, ditto debenture 53½, 53¾, 54, Liverpool 67⅜, Primitiva preference 40s. 6d., 42s., South Metropolitan 77½, 77⅛, 77⅜, 78, ditto debenture 52⅜, 53⅛, Wandsworth debenture 52⅛, British (Potteries) 3 p.ct. debenture 39½, Danish 4 p.ct. debenture 49½, Southend 7 p.ct. new "B" 51, 51½. On Wednesday, Brentford "A" 84, British 25⅜, European 8½, Gas Light ordinary 70½, 70⅛, 70⅜, ditto maximum 53⅜, Imperial Continental 130, ditto debenture 65, 65½, Primitiva 13s. 6d., South Metropolitan 77⅜, South Suburban 80, Danish 5 p.ct. debenture 50, Harwich 7 p.ct. 29s., 30s., Oxford 5 p.ct. consol. 79, 79½, ditto 5 p.ct. preference 67½, 68, Liverpool 7 p.ct. preference 100½, 101⅜, 102½, ditto £30 paid 30½-32. On Thursday, Bombay 3 5/16, Gas Light ordinary 70½, 70⅝, 70⅞, ditto maximum 53½, Primitiva 14s. 6d., South Metropolitan 77½, 77⅜, 78, 78½, 78⅛, ditto debenture 52½, Liverpool 7 p.ct. preference £30 paid 31-31⅜. On Friday, Bournemouth "B" 9⅜, Brentford "B" 82, Brighton and Hove orig. 135½, 136, Commercial 3½ p.ct. 63, European 8 5/16, 8⅜, Gas Light ordinary 70½, 70½, 70⅝, 70⅜, 70⅝, 71, ditto maximum 52⅜, ditto preference 67, 67⅛, 67½, ditto debenture 53½, 54, Imperial Continental 129, 130, 130½, 131, South Metropolitan 77½, 77¾, 78½, Tottenham "B" 69½, ditto 5 p.ct. preference 70½, Liverpool 7 p.ct. preference 101½, ditto £30 paid 31-31⅜.

In the Money Market, there was at first a fairly considerable demand; but this ere long was satisfied by adequate supplies coming in, and thence forward the position continued easy till the close. Discount also weakened. Silver hardly moved. The Bank rate is 5 p.ct., as fixed on Nov. 3.

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S BARGAINS.

Issued.	Shares.	When ex-Dividend.	Ante-War Dividend & Bonus.	Last Dividend.	NAME.	Closing Prices, July 30, 1914.	Present Prices.	Lowest and Highest Prices of Bargains.
£			p.s.					
182,049	Stk.	Aug. 26	4	4%	Aldershot 4 p.c. Pref.	...	50—55	...
1,551,868	,,	Oct. 13	9½	3 5/16%	Alliance & Dublin Ord.	59—64	50—53	...
374,000	,,	Jan. 12	4	4%	Do. 4 p.c. Deb.	76—79	46—51	...
280,000	5	Nov. 30	7½	4/-	Bombay, Ltd.	5½—6½	3½—3¾	3⅛
100,000	5	Aug. 11	16	4/7½	Bournemouth Gas & Water { 5 p.c.	...	7¾—8¼	...
383,110	10	,,	7	7/-	B 7 p.c.	13—13½	8½—9¼	9¼
113,000	10	,,	6	6/-	Pref. 6 p.c.	13½—14	7¾—8¼	...
162,065	—	Dec. 30	—	4%	4 p.c. Deb.	...	54—59	...
992,045	Stk.	July 15	14	56/-	Brentford A Consolid.	261—266	80—85	82—84
734,920	,,	,,	11	55/-	Do. B New	204—209	80—85	82
55,000	,,	,,	5	5%	Do. 5 p.c. Pref.	109—111	68—72	...
221,400	,,	Dec. 15	4	4%	Do. 4 p.c. Deb.	91—93	60—62	...
214,775	,,	Aug. 26	11	10½%	Brighton & Hove Orig.	208—213	132—137	133½—136
244,200	,,	,,	8	7½%	Do. A Ord. Stk.	154—159	92—97	...
1,287,500	Stk.	July 28	5	5%	Bristol 5 p.c. max.	...	...	...
550,000	20	Sept. 29	12½	10%	British	44—45	25—27	25¼—25½
120,000	Stk.	Dec. 30	4	4%	Do. 4 p.c. Deb. Stk.	88—90	59—64	...
245,771	,,	,,	4	4%	Buenos Aires 4 p.c. Deb.	85—87	48—52	...
100,000	10	May 27	—	6%	Cape Town & Dis., Ltd.	1½—2½	6¼—7½	...
100,000	10	Oct. 28	—	4½%	Do. 4½ p.c. Pref.	4—6	4½—5¼	...
100,000	Stk.	Dec. 30	4½	4½%	Do. 4½ p.c. Deb. Stk.	70—75	50—60	...
157,150	,,	Feb. 26	5	5%	Chester 5 p.c. Ord.	108—110	...	...
1,513,280	,,	July 28	5/9/4	42/8	Commercial 4 p.c. Stk.	106—108	60—65	...
560,000	,,	,,	5¾	38/4	Do. 3½ p.c. do.	103—105	59—64	61—63
475,000	,,	—	5	3½%	Do. 3 p.c. Deb. Stk.	69½—73½	47—50	...
800,000	,,	Dec. 15	4	—	Continental Union Ltd.	76—79	18—20	...
200,000	,,	,,	7	—	Do. 7 p.c. Pref.	115—118	33—38	...
31,600	,,	Aug. 26	15	15%	Croydon A 10 p.c.	...	160—165	...
278,400	—	,,	12	12%	Croydon B and C 7 p.c.	...	125—130	...
492,870	Stk.	—	6	4½%	Derby Con. Stk.	123—125	...	...
55,000	,,	—	4	4%	Do. Deb. Stk.	102—104	...	...
1,002,180	10	Jan. 26	10	5/0	European, Ltd.	17½—18	8—8½*	8 5/16—8⅜
16,398,975	Stk.	Aug. 11	4/17/4	46/8	Gas { 4 p.c. Ord.	98—102	69—71	70—71
2,600,000	,,	,,	3½	35/-	Light { 3½ p.c. max.	76—79	52—55	52½—54½
4,062,255	,,	,,	4	4%	and { 4 p.c. Con. Pref.	96—99	67—69	66½—67½
4,674,850	,,	Dec. 13	5	3%	Coke { 3 p.c. Con. Deb.	72½—74½	52—54	53—54
130,000	,,	Dec. 11	10	10%	10 p.c. Bonds.	...	...	...
82,500	,,	Sept. 14	5	3½%	Hastings & St. L. 5 p.c.	...	...	...
258,740	,,	,,	3½	2½%	Do. 3½ p.c.	87—89	45—55	...
70,000	10	May 12	11	5%	Hongkong & China, Ltd.	16½—16¾	5½—6½	...
86,600	Stk.	Aug. 26	9	9%	Hornsey 7 p.c.	...	100—105	...
131,000	,,	July 28	7½	7½%	Ilford A and C	151—154	85—88	...
65,780	,,	,,	6¼	5½%	Do. B	115—118	65—68	...
65,300	,,	Dec. 30	4	4%	Do. 4 p.c. Deb.	92—94	56—58	...
1,976,000	,,	Oct. 28	9	5%	Imperial Continental	130—160	128—133	129—131
1,835,000	,,	Aug. 11	3½	3½%	Do. 3½ p.c. Deb. Red.	84—86	64—69	65—65½
235,948	,,	Aug 26	6¼	6¼%	Lea Bridge Ord. 5 p.c.	119—121	72—74	...
2,498,905	,,	Feb. 26	10	57/6	Liverpool 5 p.c. Ord. { A.	211—213	...	67½
					{ B.	146—148	...	...
306,083	,,	June 26	4	4%	Do. 4 p.c. Pr. Deb. Stk.	...	...	
165,736	,,	Aug. 11	7/5/6	6%	Maidstone 5 p.c.	...	54—56	
63,480	,,	Dec. 30	—	3%	Do. 5 p.c. Deb.	...	40—43	...
75,000	5	June 11	6	3%	Malta & Mediterranean	4¾—4¾	2—2½	...
250,000	100	Oct. 3	4½	4½%	Met. of Melbourne { 4½ p.c. Deb.	99—101	93—100	...
541,920	Stk.	Nov. 30	4	4%	Monte Video, Ltd.	11¼—12	33—38	...
1,875,892	,,	July 28	4½	3%	Newcastle & Gateh'd Con.	98½—99½	67—69	...
589,705	,,	Dec. 30	3½	3½%	Do. 5½ p.c. Deb.	82—83	50—52	...
15,000	10	Aug. 26	—	7/6	North Middlesex 10 p.c.	...	12½—13	...
55,940	10	,,	7/14/10	5/3	,, ,, 7 p.c.	14—15	7¼—8½	...
300,000	Stk.	Dec. 15	8	8%	Oriental, Ltd.	117—122	84—87	...
60,000	5	—	10	—	Ottoman, Ltd.	7½—7¾	2—3	...
188,120	Stk.	Dec. 30	—	6%	Plym'th & Stonch'se 5 p.c.	...	69—71	...
60,000	50	Aug. 26	15	60/-	Portsea Island, B	128—131	64—67	...
100,000	50	,,	12	55/-	Do. C	118—121	52—54	...
249,980	5	—	8	—	Primitiva Ord.	5½—6	⅝—1	13/6—14/6
499,960	5	—	5	—	Do. 5 p.c. Pref.	4½—5	1½—2½	40/6—42/-
521,600	100	Dec. 7	4	4%	Do. 4 p.c. Deb.	91—93	65—67	...
600,000	Stk.	Jan. 26	4	4%	Do. ,, ,, 1911	...	48—52*	...
346,198	,,	Dec. 30	4	4%	River Plate 4 p.c. Deb.	85—87	48—52	...
150,000	10	Sept. 29	6	6/-	San Paulo { 6 p.c. Pref.	10½—11	6—6½	...
125,000	50	Jan. 3	5	5%	{ 5 p.c. Deb.	47—49	35—38	...
135,000	Stk.	Aug. 26	10	5%	Sheffield A	223—224	68—70	...
209,984	,,	,,	10	5%	Do. B	222—224	68—70	...
285,500	,,	,,	10	4½%	Do. C	220—222	66—68	...
135,201	Stk.	Sept. 15	4	4%	Shrewsbury 5 p.c.	...	...	...
90,000	10	Oct. 28	9	8½%	South African	10½—11½	7—9	...
4,609,895	Stk.	July 28	5/4/6	5%	South Met. Ord.	111—113	77—79	76½—78½
250,000	,,	Jan. 12	—	5%	Do. Red. Pref.	...	94—96	...
1,895,445	,,	,,	5	5%	Do. 3 p.c. Deb.	72½—74½	51—54	52½—53½
224,820	,,	Dec. 15	4½	4½%	South Shields Con. Stk.	157—159	86—88	...
1,087,795	,,	Aug. 11	6	5½%	S'th Suburb'n Ord. 5 p.c.	114—118	77—82	80
568,837	,,	Dec. 30	5	5%	Do. 5 p.c. Deb. Stk.	116—118	74—77	...
647,740	,,	Nov. 16	7½	4%	Southampton Ord.	99—102	57—60	...
121,875	,,	Dec. 30	4	4%	Do. 4 p.c. Deb. Stk.	...	58—60	...
120,000	,,	Aug. 11	—	6%	Tottenham { A 5 p.c.	135—138	75—78	...
782,275	,,	,,	6	4½%	District { B 3½ p.c.	113—117	68—71	69½
181,255	,,	Dec. 15	4	4%	{ 4 p.c. Deb.	87—89	59—62	...
182,580	10	Dec. 30	5	—	Tuscan, Ltd.	5—6	1—2	...
149,900	10	July 1	5	5%	Do. 5 p.c. Deb. Red.	93—95	45—50	...
936,476	Stk.	Aug. 26	5	5%	Tynemouth 5 p.c. max.	108½—109	63—67	...
30,000	,,	Aug. 11	8½	66/3	Wandsworth, Wimbledon, and Epsom— Wandsworth A 5 p.c.	151—156	79—81	...
855,636	,,	,,	6½	52/3	Do. B 3½ p.c.	129—134	60—62	...
108,073	,,	,,	—	46/4½	Do. C	...	57—59	...
140,865	,,	,,	—	46/4½	New Ordinary	...	57—59	...
552,000	,,	,,	6½	45/-	Wimbledon 5 p.c.	117—122	54—56	...
98,000	,,	,,	6½	50/-	Epsom 5 p.c.	121—126	57—59	...
88,476		Dec. 10		3%	[illegible] Stk.	66—6[illegible]	30—33	32½

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Compiled and noted by **JACQUES ABADY,** of the Middle Temple, Barrister-at-Law.

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(Continued on p. 280.